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The Commonwealth of Massachusetts

ANNUAL REPORT
OF THE
METROPOLITAN DISTRICT
WATER SUPPLY COMMISSION
FOR THE
YEAR ENDING NOVEMBER 30, 1938



Mass. Secretary of the Commonwealth
April 24, 1940

REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

To the Honorable the Senate and House of Representatives of the Commonwealth of Massachusetts in General Court Assembled.

The Metropolitan District Water Supply Commission, established under the provisions of Chapter 375 of the Acts of 1926, respectfully presents for the year ending November 30, 1938 its

THIRTEENTH ANNUAL REPORT

I. ORGANIZATION AND ADMINISTRATION

Eugene C. Hultman continued as Chairman of the Commission and Thomas D. Lavelle and Edward J. Kelley as Associate Commissioners. R. Nelson Molt continued as Secretary.

During the past year the Administrative functions of the Commission have been greatly increased by new construction work authorized by Chapter 460 as amended by Chapter 501 of the Acts of 1938.

This new construction was made possible because of the saving by the Commission estimated from \$12,000,000.00 to \$14,000,000.00 from the appropriation of \$65,000,000.00 authorized in 1926 and 1927 by the Legislature and these Acts were passed after consideration of the special report which, prepared under Chapter 48, Resolves of 1936, by a joint board consisting of this Commission and the Department of Public Health relative to improvements in distribution and to adequate prevention of pollution of sources of water supply of the Metropolitan water district and printed as House document No. 262, 1938, recommended among other things that the Legislature authorize the construction by this Commission of portions of a pressure aqueduct for improving the distribution of water from the sources of supply to the Metropolitan water district.

The Commission by said Chapters 460 and 501 was empowered to cooperate with the State Emergency Public Works Commission in making applications for Federal W.P.A. grants covering all major new contracts required for the completion of the Ware-Swift supply and Quabbin Reservoir, the construction of a pressure aqueduct from the Wachusett Aqueduct Terminal Chamber to a point of connection with the Weston Aqueduct Terminal Chamber and supply mains near the Charles River, and the construction of additional pipe lines in the Weston Aqueduct siphons. One such application was made August 16 for a project covering the additional construction needed to bring the existing Weston Aqueduct up to its designed capacity and a P.W.A. grant of \$207,000.00 of Federal funds was received as a contribution towards the estimated cost of \$460,000.00 for this project.

Another application was made August 30 for a project including several major contracts required to complete the Ware-Swift supply and Quabbin Reservoir, the principal item being for the clearing of the Reservoir, and the construction of the pressure aqueduct and appurtenances; and a P.W.A. grant of \$6,984,900.00 of Federal funds was received as a contribution towards the estimated cost of \$15,522,000.00 for this project.

The Legislative acts appropriated no additional funds except that they made available for the construction of the pressure aqueduct and the Weston Aqueduct siphons the unexpended balance of previous appropriations for the construction of the Ware-Swift supply. The granting of Federal funds to supplement this unexpended balance makes it possible to construct a considerable portion of the pressure aqueduct system recommended by the Joint Board as the ultimate solution of the problem of distribution of water in the District.

The Legislature by Chapters 240 and 455 of 1938 amended Chapter 321 of the Acts of 1927 and provided for the annexation of the town of Dana, as well as certain portions of Prescott and Greenwich, to the town of Petersham, and the Commission was authorized to end the corporate existence of the town of Dana in addition to the three towns of Enfield, Greenwich and Prescott.

The Commission on March 24, 1938 ordered a taking of about 120 square miles of land within the Quabbin Reservoir area. This taking embraced the towns of Dana, Enfield, Prescott and Greenwich and included for the most part land and buildings which the Commission had previously acquired; it also included such other property necessary for the construction of the reservoir, title to which had not been passed to the Commonwealth.

This taking was duly recorded on March 28, 1938 in the Registries of Deeds in the Counties of Hampshire, Franklin and Worcester and provides a complete record in each county for the convenience of the public.

Thirty days later, on April 28, 1938, the corporate existence of these four towns ceased and as provided by Chapter 321 of the Acts of 1927, and amendments thereto, the Commission acquired all the property, real and personal, and other assets of the towns and assumed all the liabilities of these municipalities.

The Secretary was appointed general agent of the Commission to liquidate and terminate, under the direction of the Commission, the affairs of each town as speedily as possible. The duties were varied as it was necessary to carry on schools to the end of the school year; generally oversee the collection of towns accounts and pay proper charges against the towns, deliver to the Secretary of State such documents from the towns as by law were required to be so delivered and to take custody of and preserve vital statistics, voting lists and other town records of permanent value.

The Commission wishes to note that full cooperation was received from other departments of the Commonwealth whereby work incident to the closing up of those towns was greatly expedited. In view of the fact that never before in the history of the Commonwealth have four communities lost their corporate existence at one and the same time and their affairs liquidated, it is a source of satisfaction to the Commission that it fulfilled its task speedily and with little or no friction.

The Commission deems it of interest to note that the town seals of these four towns have been given to the custody of the American Antiquarian Society where they will be properly designated and permanently exhibited in the Society's building at Worcester, Massachusetts, and further that such papers, pamphlets and other historical material not required by the Secretary of State or permanent records of the towns have also been given to its custody, and will be available for the use of all persons interested.

It is the intention of the Commission for the convenience of the public to house all of the permanent town records and vital statistics required to be preserved by law in fireproof vaults in the new Administration Buildings of the Commission located at Belchertown, Massachusetts, (on Massachusetts highway designated as Route No. 9), and to that effect there is appended at the end of this report an amendment of said Chapter 240 of the Acts of 1938.

The Commission having been duly advised in writing by the Attorney General that it was within the scope of its authority, has sponsored two WPA sewer projects, one in the town of Holden and one in the town of Rutland. The Commission will furnish such materials and supplies as may be necessary to construct sanitary sewers in said towns connecting with the existing main line sewer already constructed by the Commission from Rutland to Worcester, and the towns will furnish the necessary land therefor, while the Federal Government will provide the labor. By these systems the Ware and Wachusett watersheds will be relieved of a substantial and growing amount of pollution.

The clerical force of the Commission was increased to meet the requirements of all this additional work by two clerks who were added to assist the three special agents under the direction of the Commission who continued to care for the property acquired by the Commission in the Swift and Ware River areas.

Real estate purchasing agents and conveyancers and other experts were employed as needed. The engineering and clerical force of the engineering department averaged 148 employees during the year. The maximum number employed at any one time by contractors on the various construction projects during the year was 545 persons.

A force of local labor of 103 persons was employed during the year in forestry and reforestation work, the removal of bodies, and miscellaneous work for clearing and burning brush and slash on the area below the future reservoir flow line.

II. ENGINEERING DEPARTMENT

Frank E. Winsor continued as Chief Engineer, Karl R. Kennison as Assistant Chief Engineer, Walton H. Sears as Mechanical Engineer, Stanley M. Dore and Charles L. Coburn as Associate Civil Engineers, and William W. Peabody as Division Engineer of the Quabin Reservoir and Aqueduct Division with an office at Enfield, Massachusetts. The Wayland-Weston Division was established with Coleman C. McCully as Division Engineer, covering about nine miles of the easterly portion of the pressure aqueduct, with an office in Natick, Massachusetts. The Southborough-Framingham Division was established with Frederick W. Gow as Division Engineer, covering about nine miles of the westerly portion of the pressure aqueduct.

At the request of the Attorney General, consultants were employed from time to time when necessary in the preparation of data for the defense of petitions for damages against the Commonwealth and for the collection and interpretation of data on mill and water power damages, and on the design of the dam and dike of Quabbin Reservoir and geological data.

III. OFFICES

The office of the Commission and of the Chief Engineer continued on the ninth floor of the Metropolitan District Commission building at 20 Somerset Street, Boston. Offices at various places on the work were occupied from time to time as required and the office of the Quabbin Reservoir Division and laboratories for water analysis and soil testing were continued at Enfield. The office of the Wayland-Weston Division was established at 35 Main Street, Natick and of the Southborough-Framingham Division, at 4 Walker Street, Marlborough.

IV. REAL ESTATE AND WATER RIGHTS

The Commission, for reservoir purposes and sanitary protection, has acquired a total to date of approximately 80,135 acres of land in the Swift River watershed, and for sanitary protection and construction purposes in the Ware River watershed a total of about 14,751 acres. The Commission during the year from time to time publicly advertised for sealed proposals for the purchase of such standing timber as remained below the flow line of Quabbin Reservoir and accepted the highest bids therefor.

On July 25 notice was sent by the Commission to all tenants of property owned or taken by the Commission within the Quabbin Reservoir area that the Commission required the property for the use of the Commission. Rentals of property within the area then ceased with the exception of engineers and other persons by necessity remaining there.

The Commission wishes to note that a total of \$962,932.83 has been collected by the Commission in sales and rentals and salvage of property acquired by it from the inception of the Commission to the end of the 1938 fiscal year.

From September 12 to 21, rain fell almost continuously throughout Central Massachusetts. The maximum total rainfall on the Ware Watershed for this period, 17.69", was reported at Hubbardston and the maximum total rainfall on the Swift Watershed was reported as 14.29" at Enfield.

On September 21, 1938, both the Ware and Swift Rivers were at flood height. At the dam of the Intake Building on the Ware River at Coldbrook, the peak reached at 11:15 A.M. was 14,000 cubic feet a second or at the rate of 6,283,000 gallons per minute or 9,050,000,000 gallons a day or $2\frac{1}{3}$ times the flood during the year 1936.

While no damage resulted to the structures of the Commission, the flood made access to Coldbrook impossible except by walking along the tracks of the Ware River Branch of the Boston & Albany Railroad.

On the Swift River high water prevailed which was safely taken through the diversion tunnel, which as in 1936 saved the works of the Commission in the Swift River Valley from all possible damage.

The baffle dam, so called, at Greenwich Village held back water from the East Branch of the Swift River and temporarily formed a large lake of about 4,000,-000,000 gallons extending northwards towards Dana and North Dana.

This lake cut off the main North and South highway in the Swift River Valley, and the channel excavated by the Commission in 1936 under Contract No. 49 was filled and carried the water into the Middle Branch of the Swift River in that part of the former town of Prescott known as Soapstone. This storage of the water reduced materially the peak of the flood on the Swift River, and while Bondsville, Three Rivers, Ludlow and Chicopee were damaged by the flood, still greater damage would have otherwise resulted.

During the afternoon of September 21, 1938, the hurricane struck the Ware and Swift River Valleys. No material damage was done to structures of the Commission but roads not already cut off by flood were made impassable by felled trees and wires and during the night of the twenty-first, and the forty-eight hours following, the force of the Commission was constantly on duty clearing roads and repairing means of communication and looking after the safety and security of those remaining in the Valley. The Commission wishes to thank all of its employees who during both the flood and hurricane worked to make possible the rapid resumption of the work of the Commission over the wide area where its operations are carried on.

The hurricane felled about 20,000,000 feet of merchantable pine timber and an unestimated amount of other smaller timber on the Quabbin watershed and 3,000,000 feet of merchantable pine timber on the Ware River watershed. While the Commission immediately engaged in salvage operations and is negotiating with the Federal Government for the sale thereof, the hazard of fires and the preparation of the area for reforestation present a greatly enlarged task on both watersheds.

V. WARE RIVER SUPPLY

No water was diverted from the Ware River, since no storage is available pending the completion of Quabbin Reservoir.

The policy of publicly advertising for bidders on all construction work was continued and Contract No. 64, for constructing the Service Buildings at Shafts 1 and 8 of Quabbin Aqueduct in the towns of West Boylston and Barre, Massachusetts, was advertised just prior to the grant of Federal P.W.A. funds as above described. The three low bidders all agreed to accept the contract as a P.W.A. contract without modification of the bid price and it was awarded on October 25 to Platt Contracting Co., Inc., Cambridge, Massachusetts. Work is in progress under this contract.

Contract No. 65, for installing shaft caps and aqueduct control valves, Wachusett Outlet Building at Shaft 1 of Quabbin Aqueduct, was awarded on September 22 to the Engineering Service and Construction Company. Work is in progress under this contract.

VI. SWIFT RIVER SUPPLY

Reforestation of areas above the flow line of Quabbin Reservoir was continued, seed beds planted and transplanting of seedlings carried on. The Commission continued its policy of salvaging young pine, spruce, hemlock, laurel, azaleas, etc., in areas which are to be flooded by Quabbin Reservoir.

Fire lanes were kept clear above the flow line of Quabbin Reservoir affording protection to the transplants set out on the watershed of Quabbin Reservoir as well as the large areas of standing timber.

The Benjamin Foster Company continued work under Contract No. 52, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belchertown, Enfield and Ware. The hydraulic sluicing operations were completed, the central portion of the embankment being carried to about

elevation 530 or to the future flow line of the reservoir. Approximately 3,605,000 cubic yards out of a total of 3,695,000 cubic yards required in the embankment under this contract having been placed to date.

Rich Bros. Construction Co. Inc. completed work under Contract No. 56 for constructing the Administration Buildings at the main dam of Quabbin Reservoir in the town of Belchertown.

Contract No. 60, for constructing access roads at Shaft 12, was awarded on December 16 to the Middlesex Construction Company, Framingham, the lowest bidder. Work under this contract was completed.

P.W.A. contracts Nos. 61, 62 and 63 were awarded on October 20 to Coleman Bros. Corp., Boston, the lowest bidder, for clearing portions of Quabbin Reservoir.

Contract No. 66, for constructing regulating dams on the Middle Branch in New Salem and on the East Branch in Hardwick and Petersham, was advertised just prior to the grant of the Federal P.W.A. funds as above described. The three low bidders all agreed to accept the contract as a P.W.A. contract without modification of the bid price and this contract and P.W.A. contract No. 72 for clearing that portion of the Quabbin Reservoir site adjacent to Contract No. 66, were both awarded on October 20 to the C & R Construction Company, Boston, the lowest bidder. Work is in progress under these contracts.

Contract No. 88, for furnishing and storing top soil, was awarded on November 3 to Warner Bros. and Goodwin, Inc., Sunderland, Massachusetts, the lowest bidder. Work is in progress under this contract.

VII. PRESSURE AQUEDUCT

P.W.A. Contract No. 76, for making core borings along the proposed pressure aqueduct locations, was awarded on October 20 to Sprague & Henwood, Inc., Scranton, Pennsylvania, the lowest bidder. Work is in progress under this contract.

VIII. WESTON AQUEDUCT SIPHONS

P.W.A. Contract No. 73, for constructing inverted pipe siphons on Weston Aqueduct, was awarded on November 9 to the Leo Butler Company, Katonah, New York, the lowest bidder. Work is in progress under this contract.

IX. GENERAL

The engineering force continued its studies for the development of hydro-electric power at various points on the work. No electric power can be generated, however, until the completion of Quabbin Reservoir provides the necessary storage of water.

Unprecedented floods occurred in September but no important damage was done to the Commission's property or to the work under construction.

X. CEMETERIES

The Commission has continued the assignment of lots in the new Quabbin Park Cemetery and 1556 bodies were removed from the Quabbin Reservoir area during the year, of which 1533 were reinterred in Quabbin Park Cemetery. To date a total of 6180 bodies have been removed from the Quabbin Reservoir area; of which 5236 were reinterred in Quabbin Park Cemetery. There have been 16 original burials during the year in Quabbin Park Cemetery, making a total to date of 133 original burials in this cemetery. The removal of bodies from the area which will soon be flowed by Quabbin Reservoir is practically completed.

Landscaping and maintenance of Quabbin Park Cemetery have been carried on during the year and studies made for the location and construction of a permanent service building.

XI. FINANCIAL

The Commission appends hereto a statement of its expenditures and disbursements for the fiscal year, and from the date of its appointment.

XII. RECOMMENDATIONS

The Commission having made its general taking for the Quabbin Reservoir area and for the past year been engaged in winding up the affairs of the towns of Dana, Enfield, Greenwich and Prescott, have determined that public convenience will be best served by the permanent retention of the vital statistics and other official papers of the four towns by the Metropolitan District Commission and there is appended hereto a draft of an amendment to Chapter 321 of the Acts of 1927 in substance providing for this.

The Commission further have determined that the best interests of those persons interested in the maintenance of Quabbin Park Cemetery will be most satisfactorily served by the transfer of said Cemetery upon completion of the work of the Metropolitan District Water Supply Commission, to the Metropolitan District Commission; and a draft of an amendment to Chapter 321 of the Acts of 1927 in substance providing for the same is annexed to this report.

XIII. OTHER REPORTS

The report of the Chief Engineer is herewith presented.

Respectfully submitted,

E. C. HULTMAN, *Chairman*

THOMAS D. LAVELLE, *Associate Commissioner*

EDWARD J. KELLEY, *Associate Commissioner*

20 SOMERSET STREET, BOSTON, MASSACHUSETTS.

January 14th, 1939.

DRAFT OF PROPOSED LEGISLATION

THE COMMONWEALTH OF MASSACHUSETTS

In the Year One Thousand Nine Hundred and Thirty-Nine

AN ACT PROVIDING FOR THE PERMANENT CUSTODY BY THE METROPOLITAN DISTRICT COMMISSION OF THE RECORDS OF THE TOWNS OF DANA, ENFIELD, GREENWICH AND PRESCOTT.

WHEREAS, The deferred operation of this act would in part defeat its purpose, therefore it is hereby declared to be an emergency law, necessary for the immediate preservation of the public convenience.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same as follows:

SECTION 1. Section 14 of Chapter 321 of the Acts of 1927 as amended by Section 5 of Chapter 240 of the Acts of 1938 is hereby further amended by striking out all of said first paragraph of said Section 5 after the word "possible" in line 22 and inserting in lieu thereof—Upon the final liquidation of the affairs of the towns of Dana, Enfield, Greenwich and Prescott, the commission shall provide a suitable place for the preservation of the records of permanent value of the towns of Dana, Enfield, Greenwich and Prescott, to be kept by them at the Administration Buildings, Belchertown, Massachusetts, until the completion of the work of the Metropolitan District Water Supply Commission whereupon they shall turn the same over to the Metropolitan District Commission to be kept and preserved at the site of Quabbin Reservoir for public convenience.

The secretaries of the respective commissions having custody of the records, or such other person as may be duly authorized by said commissions, shall issue, if requested, duly authenticated or attested copies of said records and such copies shall have the same evidentiary value as they would have had in the event that

they were issued by a duly elected official of said towns.—So that said first paragraph of said Section 5 of Chapter 240 of the Acts of 1938 shall read as follows:

SECTION 5. Said chapter three hundred and twenty-one is hereby further amended by striking out section fourteen and inserting in place thereof the following:—Section 14. All of the property belonging to the towns of Dana, Enfield, Greenwich and Prescott shall, upon the annexation of said towns, to other towns by authority of this act, vest in and become the property of the commonwealth for the benefit of the metropolitan water district, and the commonwealth shall succeed to all the rights, claims and causes of action of each of said named towns, and shall assume and be liable for all the debts, obligations, trusts, duties and liabilities of each of said towns. All actions and causes of actions by or against the said towns of Dana, Enfield, Greenwich and Prescott, pending or accrued, when such annexation takes effect, shall survive, and may be prosecuted to final judgment and execution by or against the commonwealth. All books, papers, monies and other property in the possession of the treasurer of each of these four towns or of any town officer thereof shall be turned over to the commission at the time of said annexation, and the commission shall wind up and liquidate the affairs of each such town as speedily as possible. Upon the final liquidation of the affairs of the towns of Dana, Enfield, Greenwich and Prescott, the Commission shall provide a suitable place for the preservation of the records of permanent value of the towns of Dana, Enfield, Greenwich and Prescott, to be kept by them at the Administration Buildings, Belchertown, Massachusetts, until the completion of the work of the Metropolitan District Water Supply Commission whereupon they shall turn the same over to the Metropolitan District Commission to be kept and preserved at the site of Quabbin Reservoir for public convenience.

The secretaries of the respective commissions having custody of the records, or such other person as may be duly authorized by said commissions, shall issue, if requested, duly authenticated or attested copies of said records and such copies shall have the same evidentiary value as they would have had in the event that they were issued by a duly elected official of said towns.

THE COMMONWEALTH OF MASSACHUSETTS

In the Year One Thousand Nine Hundred and Thirty-Nine

AN ACT PROVIDING THAT THE CARE AND CONTROL OF QUABBIN PARK CEMETERY BE TRANSFERRED TO THE METROPOLITAN DISTRICT COMMISSION UPON THE COMPLETION OF THE WORK OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

SECTION 1. Section 9 of Chapter 321 of the Acts of 1927 is hereby amended by striking out all of the first paragraph of said Section 9 after the word “therefor” in line 22 and inserting in lieu thereof—Any such general burial ground or grounds shall, upon the completion of the work of the Commission, be transferred to the Metropolitan District Commission and said transfer shall include the transfer of any trust funds established for the benefit or care of the cemetery or lots therein which contained remains thus removed to such general burial ground—so that said first paragraph of said Section 9 of said Chapter 321 of the Acts of 1927 shall read as follows:—

SECTION 9. If any burial ground, cemetery, grave or place of human burial is within the area taken in fee by the commission, or is located so near to the reservoir or other waterway as to be liable to pollute or reduce the quality or value of any such waters as a potable water supply, the commission shall remove

the remains found in any such burial places. The Commission may agree with the next of kin, or other persons having the right to represent or dispose of such remains, as to the place or places to and in which such remains shall be removed and reinterred, and in such case the commission may pay the reasonable cost of a burial lot and shall pay the expenses reasonably necessary for such removal, including the removal and resetting of the gravestones, monuments and markers of such graves. In any case where such next of kin or other persons are unknown or unascertainable, or where there is no such agreement, the commission shall furnish a place or places for such reburials, and may establish a general burial ground or grounds therefor, and subject to the provisions of section thirty-five of chapter one hundred fourteen of the General Laws, may acquire by purchase or otherwise as provided by this act any lands needed therefor. Any such general burial ground or grounds shall, upon the completion of the work of the Commission, be transferred to the Metropolitan District Commission and said transfer shall include the transfer of any trust funds established for the benefit or care of the cemetery or lots therein which contained remains thus removed to such general burial ground.

REPORT OF THE CHIEF ENGINEER

To the Metropolitan District Water Supply Commission.

GENTLEMEN :—The following is a report of the engineering department for the year ending November 30, 1938.

ORGANIZATION

Early in the year the Legislature extended the scope of the work to be done by this Commission so as to include portions of a pressure aqueduct and other work in accordance with recommendations of the joint board, consisting of the Metropolitan District Water Supply Commission and the Department of Public Health. It has been necessary to increase the engineering organization about 47 per cent during the year to handle the work of additional surveys and contracts in connection with the proposed pressure aqueduct.

Karl R. Kennison, Assistant Chief Engineer, continued in charge of all studies in connection with the general plan of the work and the design of structures, preparation of contract specifications, contract and working drawings.

Charles L. Coburn and Stanley M. Dore, Associate Civil Engineers, continued their general supervision of the detailed work of the office, and Walton H. Sears, Mechanical Engineer, continued in charge of the collection of data in connection with mill and water power damages. They have assisted in the preparation of contract specifications.

William W. Peabody, Division Engineer, continued in charge of the Quabbin Reservoir and Aqueduct Division. Two new divisions were established, the Wayland-Weston Division, October 7, in charge of Coleman C. McCully, Division Engineer, and the Southborough-Framingham Division, October 17, in charge of Frederick W. Gow, Division Engineer.

Charles T. Main, consulting engineer of Boston, Thaddeus Merriman, consulting engineer of New York, Warren J. Mead, geologist of Massachusetts Institute of Technology, and other experts were employed from time to time.

The assignment of employees under the direction of the Chief Engineer at the end of the year and of the preceding year was as follows:

	Nov. 30, 1937	Nov. 30, 1938
Headquarters Office, Designing Division	52	46
Coldbrook Office, Quabbin Reservoir and Aqueduct Div.	11	14
Enfield Office, Quabbin Reservoir and Aqueduct Div.	88	98
Marlborough Office, Southborough-Framingham Division	0	19
Natick Office, Wayland-Weston Division	0	45
Total Engineering Force	151	222

The maximum force during the year was 222, during the week ending December 3, 1938. The minimum force was 132, during the week ending April 16 and nine weeks ending June 25. The average force for the year was 148.

OFFICES

The office of the Chief Engineer and Designing Division was continued in the Metropolitan District Commission Building at 20 Somerset Street, Boston. The offices of the Quabbin Reservoir and Aqueduct Division in the Ware River intake building in Coldbrook and in the property of the Commonwealth formerly known as the Frances W. Chandler house on Quabbin Road in Enfield, were continued throughout the year. On October 7, the Wayland-Weston Division was established with an office at 35 Main Street, Natick. On October 17, the Southborough-Framingham Division was established with an office at 4 Walker Street, Marlborough. Branch offices were maintained at other locations where work under important contracts was in progress. The laboratories for water analysis and for soil testing were continued in the property of the Commonwealth, formerly known as the Barlow house, in Enfield.

HEADQUARTERS OFFICE

Summary of the Year's Work

Real Estate.—Reports and recommendations with respect to the purchase of real estate for the Quabbin Reservoir and its sanitary protection were submitted to the Commission during the year covering 1,482 acres, making a total reported on to date of 86,013 acres. Real estate taking plans were prepared and filed March 28, covering the entire area of 74,886 acres within the general taking line adopted by the Commission September 2, 1937, as shown on a map, Accession 24,665, contained in the special report of the joint board, published as House Document No. 262 of 1938. A summary of all real estate acquired for the Quabbin Reservoir and its sanitary protection is shown in an appended table.

ACQUISITION OF REAL ESTATE FOR QUABBIN RESERVOIR

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1938	10,344
Total to Nov. 30, 1937	69,791
Total to Nov. 30, 1938	80,135

Options outstanding Nov. 30, 1938, include 62 acres outside the general taking line.

Reports and recommendations with respect to the purchase of real estate for sanitary protection in the Ware River watershed above the intake works at Coldbrook were submitted to the Commission during the year covering 2,072 acres, making a total reported on to date of 23,352 acres.

ACQUISITION OF REAL ESTATE FOR WARE RIVER WATERSHED PROTECTION

	Title Vested in Commonwealth (Acres)
Total for year ending Nov. 30, 1938	902
Total to Nov. 30, 1937	13,849
Total to Nov. 30, 1938	14,751

Options outstanding Nov. 30, 1938 include 398 acres.

An appended table shows all real estate taking plans prepared and filed during this and previous years.

Water Diversion Damage Claims.—The preparation of data for the use of attorneys in anticipated water diversion cases was continued.

Contracts and Specifications.—Contract 60, for constructing access roads to Shaft 12 of the Quabbin Aqueduct in the towns of Hardwick and Greenwich, was executed January 6.

Plans and specifications were prepared for Contracts 61, 62, 63 and 72, PWA contracts, for clearing portions of the site of Quabbin Reservoir in the towns of Belchertown, Hardwick, New Salem, Pelham, Petersham, Shutesbury and Ware, including areas which were in the former towns of Dana, Enfield, Greenwich and Prescott. Contracts 61, 62 and 63 were executed October 20; and Contract 72, October 25.

Plans and specifications were prepared for Contract 64, a PWA contract, for constructing the service buildings at Shafts 1 and 8 of Quabbin Aqueduct in the towns of West Boylston and Barre. The contract was executed October 25.

Plans and specifications were prepared for Contract 65, for installing shaft caps and aqueduct control valves and for constructing appurtenant works in the Wachusett outlet building at Shaft 1 of Quabbin Aqueduct in the Town of West Boylston. The contract was executed September 22.

Plans and specifications were prepared for Contract 66, a PWA contract, for constructing regulating dams on the Middle Branch of the Swift River in the Town of New Salem and on the East Branch of the Swift River in the Town of Hardwick and in the former Town of Dana, now Petersham. The contract was executed October 25.

Contracts 68 and 69 were prepared, being agreements with the towns of Rutland and Holden respectively, under which the Commission will sponsor WPA projects, and will furnish the necessary materials, supplies and engineering services, required for the construction of sanitary sewerage systems in these towns. Contract 68 was executed October 3; and Contract 69, August 31.

Plans and specifications were prepared for Contract 73, a PWA contract, for constructing additional inverted pipe siphons on the Weston Aqueduct at Sudbury River and Happy Hollow, in the towns of Framingham and Wayland. The contract was executed November 17.

Plans and specifications were prepared for Contract 74, a PWA contract, for constructing the Southborough Tunnel, Section 2 of the pressure aqueduct, in the Town of Southborough. The contract was advertised for the opening of bids on December 15, 1938.

Plans and specifications were prepared for Contract 76, a PWA contract, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester. The contract was executed October 21.

Plans and specifications were prepared for Contract 85, a PWA contract, for furnishing and delivering precast steel-cylinder reinforced concrete pressure pipe in the towns of Southborough, Framingham, Wayland, Natick and Weston. The contract was advertised December 1, 1938, for the opening of bids on December 19.

Plans and specifications were prepared for Contract 88, for furnishing and storing top soil at the site of the Quabbin Dike and the Quabbin Park Cemetery in the Town of Ware. The contract was executed November 3.

Working drawings for Contracts 52, 56, 65 and 66 were prepared and issued.

Inspection and Tests.—E. L. Conwell and Company continued the testing of cement until December 31, 1937, after which time this testing was done by the New England Inspection Bureau, as well as the testing of asphalt waterproofing for use under Contract 52, structural and reinforcing steel furnished under Contract 56, stone for use on Contract 60 and steel castings for valves, pressure relief valve connections and shaft caps to be installed under Contract 65. The Worcester Polytechnic Laboratory continued the testing of concrete cylinders furnished under Contracts 52, 56 and 64. Miscellaneous steel and iron for use on Contract 52, stone and electrical equipment for use on Contract 56, and iron and steel stop shutters, racks, gate valves and travelling crane purchased for installation in the Swift River intake works at Shaft 12 and in the release control works at the main dam were inspected by the engineering force.

Hydrographic Data.—The gaging station on the Ware River at Coldbrook was continued in cooperation with the U. S. Geological Survey.

The gaging station on the Chicopee River at the United Electric Light Company plant at Bircham Bend was continued in cooperation with that company and the U. S. Geological Survey until it was destroyed by the flood in September.

The gaging station on the Swift River above the intake to the stream control tunnel at the main dam was continued until August 11.

Cooperation with the U. S. Geological Survey in the operation and maintenance of the gaging stations on the Swift River near the outlet of Pottapaug Pond in Hardwick and on the Connecticut River at Thompsonville, Connecticut, was continued.

Examination of the waters of the Ware, Swift and Chicopee rivers included analyses of samples taken at many places and observations of flow at additional temporary gaging stations.

Unprecedented Floods

On September 20 to 26, a flood occurred on the Ware watershed that far exceeded any that has occurred within the memory of the oldest residents. The peak occurred at 11:15 A.M. September 21, being at the rate of about 9,040 million gallons per day, or 145 cubic feet per second per square mile of watershed area. This peak was $2\frac{1}{3}$ times the peak reached during the flood of March, 1936. The depth of flow over the diversion dam was 7.28 feet. Since Wachusett Reservoir was full at the time and Quabbin Reservoir not yet ready to begin storage of water, no diversion at the Ware River intake works was made.

A similar unprecedented flow would have occurred on the Swift River at the main dam except for the fact that the East Branch Baffle which was constructed

across the East Branch of the Swift River subsequent to the 1936 flood, and recently completed, materially reduced the flow down the East Branch, retaining in storage a quantity estimated at over 4,000 million gallons from about 50 square miles of watershed area. The actual peak flow past the main dam site through the stream control tunnel occurred at 11 A.M., September 22, being at the rate of about 3,580 million gallons per day, or 29.8 cubic feet per second per square mile of watershed area.

A hydrograph of the floods on the Ware River at Coldbrook and on the Swift River at the main dam is appended hereto.

Ware River Diversion

No water was diverted into Wachusett Reservoir. The steel bulkhead and gates, about 2,200 feet west of Shaft 8, prevent any diversion of the Ware River westerly. This bulkhead will be removed upon the completion of Quabbin Reservoir.

Sewage Diversion from Ware River Watershed

The Rutland-Holland Sewer continued in operation. During the fiscal year of the City of Worcester, which includes the 12 months ending December 31, 1938, 57,863,000 gallons of sewage were discharged into the sewerage system of the City of Worcester, of which 29,795,000 gallons came from the U. S. Veterans Hospital.

Investigation of Distribution System

Work was continued in accordance with the requirements of Chapter 48 of the Resolves of 1936, relative to improving the distribution of water and more adequately preventing pollution of the sources of water supply of the Metropolitan Water District. An engineering report to the joint board, consisting of the Metropolitan District Water Supply Commission and the Department of Public Health, was completed. The board's report, dated December 1, 1937, was filed as required by the resolve and was later published by the Legislature as House Document No. 262 of the year 1938. Following the publication of the report, further studies were made and additional data prepared for the benefit of committees of the Legislature.

Contract 58.—Contract 58, with the Pennsylvania Drilling Company, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester, to obtain data for the report, was completed December 3, 1937.

The value of work included in contract estimates during the year was \$1,173.54, the final estimate dated December 18, 1937, being for \$50,944.65.

Portion of Work Under ~~WPA~~

Under the provisions of the legislation in Chapter 501 of the Acts of 1938, certain parts of the work necessary to complete Quabbin Reservoir and the Swift supply as well as certain portions of a pressure aqueduct and appurtenances recommended by the joint board in House 262, are being financed with the aid of two grants by the Federal Emergency Administration of Public Works, all which work is required to be completed ready for operation on or before June 30, 1940, as follows:

PWA Docket No. Mass. 1520-F, Mass. State Project D-202

Weston Aqueduct siphons, additional pipe lines.

Cleaning and lining existing pipe in these siphons.

PWA Purchase of miscellaneous equipment.

WPA Docket No. Mass. 1551-F, Mass. State Project D-208.

Clearing Quabbin Reservoir site.

Concrete dams to control shallow flowage on the Middle and East branches of the Swift River.

Quabbin Hill Road between main dam and dike.

Service buildings at Ware River intake and Wachusett outlet of Quabbin Aqueduct.
 Core borings along pressure aqueduct line.
 Pressure tunnel section of the pressure aqueduct under Sudbury Reservoir.
 Purchase of precast concrete pipe for cut-and-cover pressure aqueduct.
 Construction of cut-and-cover section of the pressure aqueduct from Wachusett Aqueduct terminal chamber to Weston Aqueduct supply mains.
 New high-level distributing reservoir.
 Purchase of pumps, valves, stop logs and miscellaneous equipment.
 Spot Pond by-pass.

Design of Structures

Main Dam and Spillway.—Studies were continued of the materials in the main dam embankment as revealed by tests of samples taken periodically from the embankment, including samples from the observation wells in the interior of the impervious core, as a guide in the proper control of borrow pit materials used in the hydraulic sluicing. Studies were made of the spillway channel, designed to discharge under the stone arch bridge which carries the east access road across the channel.

Dike Embankment.—Studies were made and designs completed for monumental boulders which were selected from rejects at the quarry site and installed in central grass plots at the two ends of the dike.

Main Dam Intake Works.—Studies were continued of the requirements for equipment at the main dam intake. One 48-inch gate valve, one 48 x 72-inch sluice gate and one 3-ton crane were purchased for installation in the intake works. Also, two 36-inch gate valves were purchased for temporary installation in the siphon designed for by-passing the Swift River during the operation of plugging the stream control conduit.

Power Development at Main Dam Outlet Works.—Studies were continued of the requirements of hydroelectric power development at the outlet works downstream from the stream control tunnel at the main dam, and designs were continued for these outlet works. One 60-inch, one 48-inch and three 36-inch gate valves, and one 48-inch, one 24-inch and one 12-inch Dow-disc regulating valves were purchased for installation in the outlet works.

Roads.—Studies were made of the location of a highway between the main dam and dike via Quabbin Hill.

Quabbin Park Cemetery.—Studies and designs were completed for a memorial gateway which was constructed at the entrance to Quabbin Park Cemetery.

Shallow Flowage.—Studies and designs were completed of low dams to maintain the water level in areas of shallow flowage on the margins of Quabbin Reservoir. One dam, on the upper end of the Middle Branch of the Swift River, includes a circular spillway about 135 feet long and 23 feet high with crest at the reservoir flow line, elevation 530. The other dam, on the East Branch below the outlet of Pottapaug Pond, includes a circular spillway about 135 feet long and 17 feet high. The crest is at approximately the elevation of the reservoir flow line but was designed slightly V-shaped in cooperation with the U. S. Geological Survey, which plans to use it as a control for automatic gaging of the flow of the stream.

Shaft 8. Ware River Intake Works.—Studies and designs were completed for a service building adjacent to the intake building which will include space for garaging 3 trucks, a greasing pit, storeroom and public toilets.

Shaft 4 of Quabbin Aqueduct.—Studies were completed and designs made for a gasoline-driven 2-ton hoist which was purchased and installed in the head house making it unnecessary to continue the unsatisfactory use at this shaft of an automobile hoist.

Quinapoxet River Diversion.—Studies were continued relative to diverting into the aqueduct at Shaft 2 the waters of the Quinapoxet River for storage in Quabbin Reservoir.

Shaft 1. Wachusett Outlet Works.—Studies and designs were completed for gates to control the discharge from Quabbin Aqueduct into Wachusett Reservoir. The installation includes a 90-inch shaft cap with 24-inch opening and removable cover, and an extension of the lower of the two 90-inch shaft outlets. Two 72-inch Dow-disc regulating valves in the extension discharge beneath the outer building wall horizontally into Wachusett Reservoir below the water surface. These two valves are designed for slow closure and are in series, one being electrically operated and intended for regular use in controlling the rate of discharge and the other being hand operated and acting as a guard gate. The installation also includes three 24-inch Lombard-type pressure relief valves designed to prevent excessive water hammer in any possible contingency. The upper of the two shaft outlets, to which the penstock of a future water turbine would be connected, is designed to be temporarily closed by a 90-inch cover of the same design as the shaft cap, a 24-inch gate valve and a 24-inch bursting plate.

Wachusett Outlet Buildings.—Studies and designs were completed for a service building adjacent to the shaft outlet building which will include space for garaging 2 trucks, a storeroom, public toilets and a heating plant which can serve the shaft outlet building as well as the service building.

Diversion of Industrial Wastes.—Studies were continued of methods of disposal of objectionable wastes including diversion into the Rutland-Holden Sewer constructed under Contract 39. Materials and equipment were requisitioned for use on two WPA projects, for which the Commission, as sponsor, will purchase such materials and equipment. One project is for the construction of a sewerage system in the Town of Rutland and the other in the Town of Holden, both of which will discharge into the Rutland-Holden Sewer at three or more points. Studies and designs were made for the layout of these systems and for a measuring station to be installed in the Rutland-Holden Sewer at the Rutland-Holden town line. From this and other existing measuring stations the quantities discharged into the sewer by these two towns can be determined.

Weston Aqueduct Siphons.—Studies and designs were made of additional pipe lines necessary to be added to the Sudbury River and Happy Hollow siphons to bring the Weston Aqueduct up to its designed capacity. The original design included three 7-foot steel pipes in each of these siphons, of which only one was built. Studies indicated that a single additional pipe line in each siphon, 104 inches in diameter and mortar-lined to prevent deterioration will satisfactorily meet the requirements, particularly if the existing pipe is cleaned and lined with cement mortar to prevent further deterioration to restore its original capacity. The aqueduct was unwatered and the pipes in the siphons entered for inspection August 10. The interior was found very badly tuberculated, some of the pits beneath the tubercules being $\frac{1}{4}$ -inch deep. The outside of the pipe was examined in several places and found to be in good condition. The pipe crossing the Sudbury River is constructed as a self-supporting arch in which there are small leaks due to expansion and contraction at the joints. The new pipe is designed to be laid beneath the bed of the river.

Pressure Aqueduct Line.—Studies were made of the location, type and dimensions of a pressure aqueduct and appurtenances to be constructed from the Wachusett Aqueduct terminal chamber in Northborough to the Weston Aqueduct supply mains in Weston, as a part of the proposed plan for pressure distribution to the District. Restrictions on the cost will make it necessary to construct this entire line west of the Charles River, over 18 miles long, as a cut-and-cover surface line with the exception of three miles in tunnel underneath the Sudbury Reservoir. This pressure aqueduct will take its pressure from an equalizing basin at the outlet of Wachusett Aqueduct, the spillway level of which will be about elevation 278.5 above Boston City Base and the normal maximum operating level of which will be about elevation 278. In the line west of the Charles River, will be included a new distributing reservoir in the Town of Weston, the normal maximum operating level of which will be about elevation 272. This is only one foot higher than the flow line of the present Middlesex Fells Reservoir

on the northern high service, which can be enlarged and lowered for use in connection with the proposed future tunnel loop under the District, and 11 feet higher than the present Fisher Hill Reservoir of the southern high service. The proposed operation of this future system is described in the report of the joint board, House 262, 1938. Studies of the proposed water supply needs indicate the desirability of constructing that portion of the line east of Sudbury Dam in two stages, that is, as a single line of a diameter smaller than may be required in the future, with provision for a future parallel line, the installation of which could be delayed to an indeterminate extent by temporary pumping under peak load conditions.

Section 1 of Pressure Aqueduct.—Studies and designs were made for Section 1 of the pressure aqueduct consisting of (1) the diversion of local drainage from a section of the present open channel, about 2,500 feet long, just downstream from the Wachusett-Aqueduct terminal chamber, which will act as an equalizing basin between the Wachusett grade-line aqueduct and the pressure aqueduct. This basin will have a capacity of about $1\frac{1}{2}$ million gallons per foot of draft. An emergency overflow spillway will be built across the open channel, with crest at about elevation 278.5, discharging into the existing open channel any water released from Wachusett Dam through Wachusett Aqueduct which is not taken into the pressure aqueduct. Drainage channels will be constructed on either side of this equalizing basin and discharge their flows, including heavy flood run-offs, into the existing open channel below the overflow dam; (2) a cut-and-cover aqueduct consisting of about 9,700 feet of 12'-6" pipe extending from intake works just above the overflow dam to a convenient point on the west side of Sudbury Reservoir and as close to it as topographic conditions will permit. This section of the aqueduct will be constructed practically at the hydraulic grade line. It is designed with connections to permit future extension to Wachusett Reservoir when and if it becomes necessary to supplement the capacity of the existing Wachusett Aqueduct and accordingly is designed to take such additional pressure as it may be required to sustain under such future conditions. Studies indicate the most economical type of satisfactory permanent construction of this line will consist of precast units of steel-cylinder reinforced concrete pipe.

Section 2 of Pressure Aqueduct. Southborough Tunnel.—Studies and designs were made for Section 2 of the pressure aqueduct consisting of about 3.0 miles of 14-foot tunnel passing beneath Sudbury Reservoir to a point below the Sudbury Dam. On account of the PWA requirements for early completion, this tunnel is designed to be constructed from four shafts, the maximum distance between shafts being about 1.05 miles. Shaft 1 at the west end is designed as a dwtake shaft through which water enters the tunnel from the cut-and-cover aqueduct in Section 1. Shaft 3 is designed to act as an emergency spillway, the overflow being into Sudbury Reservoir. The top of the shaft is designed to permit raising the elevation of this spillway if at some future time the pressure aqueduct is extended westerly to a connection with Wachusett Reservoir.

Shaft 4, at Sudbury Dam, is designed as an uptake shaft to deliver water from the tunnel to the cut-and-cover aqueduct in Section 3. This shaft is very similar in design to Shaft 1 of the existing Quabbin Aqueduct at the point where the latter discharges into the upper end of Wachusett Reservoir. The uptake contains a 108" x 69" Venturi meter. It is sealed into the ledge and has two branches at the top, one to the cut-and-cover aqueduct which is proposed to be built at this time and the other permitting connection to a future parallel line, if required. In addition to the wet well, there is also a dry well with a pump chamber at the bottom for unwatering the tunnel. The design of this dry well and pump chamber is very similar to the corresponding one on the Quabbin Aqueduct. In fact, it is planned to use the same 900-horsepower motor lowered into the shaft with a crane in the same way. Two 24-inch pressure relief valves similar in every respect to those on Quabbin Aqueduct will be installed, discharging into the river below the dam. Gates will be provided for regulating the flow to the District through the new pressure aqueduct. The entire works at the shaft head will be housed in a building situated on the grounds just below the dam.

A connection will be provided from the shaft head to the two 60-inch pipes which are now used to conduct the water from two water wheels in the power house on Sudbury Dam to the upper end of Weston Aqueduct. Upon the completion of these connections, and of the additional pipe lines in the Weston Aqueduct siphons, it will be possible in an emergency to utilize the total designed capacity of Weston Aqueduct, supplying water to this aqueduct either from the new pressure tunnel under Sudbury Reservoir, or as at present from the Sudbury Reservoir. It will also be possible in an emergency to supply the new pressure aqueduct directly from Sudbury Reservoir which will be held in reserve for such emergency use. Except for such use of these connections as may be required in emergencies, the supply to the District will come entirely from Wachusett Reservoir through the new pressure aqueduct, and a portion of this supply can be delivered to the District through the existing Weston Aqueduct to such extent as may be found economical in order to utilize the capacity of the existing supply lines to the District from this aqueduct.

Access to the tunnel can be had through manholes provided at Shafts 1 and 4, and also in emergencies from Shafts 2 and 3, the tops of which are designed similar to the construction shafts, 3, 5, 6, 7, 10 and 11 of Quabbin Aqueduct, with removable slabs protected by earth cover and with vents designed to pass air freely but to prevent pollution.

Electric Power for Construction.—Studies were made of the power requirements of contractors, particularly for the construction of the proposed tunnel under Sudbury Reservoir. Agreements were made with the Metropolitan District Commission, New England Power Company and Boston Edison Company for the use of power generated in the District's power plants at Wachusett and Sudbury dams and for supplementary power from the lines of the power companies, at rates which make it possible for the Commission's contractors to obtain electric power at Sudbury Dam at \$0.007 per kilowatt hour.

Pressure Aqueduct East of Sudbury Dam.—Studies and designs were made for the pressure aqueduct between the uptake shaft at Sudbury Dam and down-take shaft which will later be constructed near the Charles River. Cost studies were made of various types of construction of large pipe lines. This line as designed will consist of about 13 miles of 11'-6" pipe, constructed of precast units of steel-cylinder reinforced concrete pipe. This length will be divided into four laying contracts: Section 3, about 3.1 miles from Sudbury Dam to Edgell Road; Section 4, about 3.4 miles further to Old Connecticut Path; Section 5, about 3.4 miles further to Winter Street and Section 6 extending about 0.9 mile further to the proposed distributing reservoir and about 2.2 miles easterly from the reservoir to the river. Section 6 will have in addition to the distributing reservoir a 7-foot diameter connection extending about $\frac{1}{3}$ mile north from the aqueduct to the existing Weston Aqueduct supply mains and a short distance still further to the Weston Aqueduct terminal chamber.

This connection will permit delivery direct from Wachusett Reservoir and the discontinuance of the use of Sudbury Aqueduct as soon as this portion of the pressure aqueduct is completed. However, the existing pipe lines from Weston Aqueduct and the distributing reservoirs and supply lines of the southern high service will be taxed to their capacity during the next few years or until the pressure tunnel can be completed from the downtake shaft at the Charles River to Chestnut Hill. Upon such completion, the use of Chestnut Hill Reservoir and pumping at Chestnut Hill can be discontinued. The 7-foot connection between the pressure aqueduct line and Weston Aqueduct also will then provide an emergency connection directly from Weston Aqueduct by way of the pressure tunnel to Chestnut Hill.

Aerial Photographs.—An aerial survey was made of the entire aqueduct line between the Sudbury Dam and the Charles River, scale 1 inch=about 400 feet, and a mosaic map prepared consisting of 5 sheets, each approximately 38 by 33 inches and each covering an area approximately 2.9 by 2.5 miles. The photographs were taken by the 101st Photo Section, 26th Division Air Service, Massachusetts National Guard.

New Distributing Reservoir.—Studies and designs were made for the new distributing reservoir with a capacity of approximately 130 million gallons, or about 13 million gallons in the upper foot. This reservoir with its flow line at about elevation 272 will permit a future connection to be made with a similar reservoir at a slightly lower elevation in the Middlesex Fells as soon as conditions warrant completion of the pressure tunnel loop under the District, as recommended by the joint board in House 262, at which time pumping to the northern high service from Spot Pond can also be discontinued. Until the completion of the pressure tunnel loop, this new distributing reservoir will, by a new pressure tunnel to Chestnut Hill, serve the southern high service with some reinforcement from the Waban Hill and Fisher Hill reservoirs.

Maintenance of Records

Photographic Records.—The taking of moving pictures from time to time to illustrate the progress of the work was continued.

Cemetery Records.—Records of assignment of lots and interments in Quabbin Park Cemetery and of the general removal of bodies from existing cemeteries in the reservoir area were maintained.

Cost Records.—Assistance was given to the Secretary's office in the apportioning of costs and the preparation of financial statements. Time and cost records covering all operations under PWA grants were maintained.

Inventories.—Inventory records of tools and equipment in the Commission's offices and storehouses were kept up to date.

WAYLAND-WESTON DIVISION

The Wayland-Weston Division was established October 7, with headquarters, occupied October 10, in the Hogan Block, 35 Main Street, Natick. This division, until the establishment of the Southborough-Framingham Division on October 17, was in charge of preliminary investigations, surveys, and field work, in connection with the proposed pressure aqueduct east of the Wachusett Aqueduct terminal chamber; and since the establishment of the Southborough-Framingham Division, is in charge of the easterly portion of this aqueduct line consisting of the section east of Edgell Road, Framingham, including the new distributing reservoir in Weston, and also of the construction of additional pipe lines in the Sudbury River and Happy Hollow siphons on the Weston Aqueduct. Prior to the establishment of the division in Natick, temporary field offices for work on the pressure aqueduct line were made available at the terminal chamber of Wachusett Aqueduct and in the caretaker's quarters at Lake Cochituate, through the courtesy of Superintendent Allardice of the Wachusett Division and of Superintendent Aubey of the Sudbury Division, respectively, of the Metropolitan District Commission.

Miscellaneous Office Work

Traverse lines were calculated, reduced, and plotted on the coordinate system previously established by the Metropolitan District Commission for work along the Wachusett and Weston aqueducts. Contour maps were prepared of the areas along the cut-and-cover portions of the pressure aqueduct and at the tunnel shaft heads. Real estate calculations and plans are in progress.

Miscellaneous Field Work

Topography was taken at the four shaft sites of the Southborough Tunnel to determine the areas required for the disposal of tunnel spoil and for the treatment of drainage from the Contractor's operations. The center line of the tunnel was taped, a distance of 3.0 miles, and the surface profile taken, including soundings in Sudbury Reservoir, the tunnel line being carried across Sudbury Reservoir by triangulation. Real estate surveys were made for property takings at the shaft sites and for a strip 50 feet wide along the tunnel line. The surveys included the location of many buildings in Southborough.

Topography was taken of areas on both sides of the open channel for a distance of about one-half mile easterly from the Wachusett Aqueduct terminal chamber.

Topography surveys were completed over about 10.6 miles of the cut-and-cover portions of the pressure aqueduct. Cutting and staking of the line and real estate surveys are in progress. Levels were run at frequent intervals from precise benches previously established by the Metropolitan District Commission along the Weston Aqueduct. Test pits and rod soundings were started and continued during the last week of the year with a labor force which averaged about 7 men.

Progress of Contracts

Contract 73.—Bids were opened November 2, for constructing inverted pipe siphons on the Weston Aqueduct at Sudbury River and Happy Hollow in the towns of Framingham and Wayland. This is a PWA contract. Eight bids were received, four for precast steel-cylinder concrete pipe ranging from \$265,832.50 to \$440,357.50, and four for steel plate mortar-lined pipe ranging from \$309,855.00 to \$338,645.00. The contract was executed November 17 with Leo Butler Company, Katonah, New York, the lowest bidder, for precast steel-cylinder concrete pipe. The work contracted for consists of constructing an additional pipe line 102 inches in diameter in each of the two siphons on the Weston Aqueduct. Work was started November 9, and the assembling of the contractor's plant is in progress.

No estimate for payment was made before November 30.

Contract 76.—Bids were opened October 10, for making core borings in the counties of Middlesex, Norfolk, Suffolk and Worcester. This is a PWA contract. Four bids were received, ranging from \$11,885.00 to \$21,700.00. Two were from contractors in Pennsylvania, and one each from contractors in Indiana and Minnesota. The contract was executed October 21 with Sprague and Henwood, Incorporated, Scranton, Pennsylvania, the lowest bidder. The work was begun October 21, since which time four drilling rigs have completed 21 holes at various locations along the line of the cut-and-cover portions of the pressure aqueduct. The contractor's force averaged 5 men.

No estimate for payment was made before November 30.

SOUTHBOROUGH-FRAMINGHAM DIVISION

The Southborough-Framingham Division was established October 17 with headquarters in a building formerly occupied as a dwelling house at No. 4 Walker Street, Marlborough. This division is in charge of the westerly portion of the proposed pressure aqueduct line consisting of the section between the Wachusett Aqueduct terminal chamber and Edgell Road, Framingham, and including the Southborough Tunnel beneath Sudbury Reservoir. Supervision of this work was taken over from the Wayland-Weston Division which had commenced the investigations and surveys.

Progress was made on surveys and profiles along the aqueduct line. During the last two weeks of the year test pits were dug and rod soundings made with a labor force of 5 men.

QUABBIN RESERVOIR AND AQUEDUCT DIVISION

The Quabbin Reservoir and Aqueduct Division, continued in charge of the work on the Ware River watershed, of the maintenance of the Rutland-Holden sewer, of the maintenance and operation of the Ware River intake works at Coldbrook and the Wachusett outlet works at West Boylston, of the field work in the Swift River valley in connection with the proposed Quabbin Reservoir, including topographic and real estate surveys, clearing, cemetery removals and reforestation, of the soil testing and water analysis laboratories, of the investigations, surveys, etc., along the Ware, Swift and Chicopee rivers, and of the construction of the main dam, shallow flowage regulating dams, relocated highways, and the group of administration buildings at the main dam.

Miscellaneous Office Work

Semi-monthly estimates for Contracts 50, 52 and 60, monthly estimates for Contract 56, and final estimates for Contracts 47, 50, 53 and 57 were prepared. Additional real estate plans were prepared on miscellaneous properties in the Ware River watershed, final tracings being made of about 3,250 acres, making a total to date of about 10,000 acres. Record tracings of the plans showing the Ware River drainage divide were continued. Following the general taking and the consequent discontinuance of the towns of Dana, Enfield, Greenwich and Prescott, an inventory of town equipment was made and town records checked. Daily rainfall and temperature records and continuous records of the flow of the Ware River were kept at the intake building. Daily rainfall records were kept at West Rutland. Daily rainfall and temperature records were kept at Enfield. Continuous records of the flow of the Swift River were kept at the main dam site. Work on the record plans and tracings of the Daniel Shays Highway between Belchertown and New Salem was continued and work commenced on the record plans of the Petersham-New Salem Highway. Work was commenced on the plotting of cross sections and profiles, and the preparation of contract drawings for a proposed access highway via Quabbin Hill between the main dam and dike. Photographs of the progress of construction were taken.

Miscellaneous Field Work

Lines and grades were given for construction under Contracts 50, 52, 56, 60, 61, 62, 63, 64, 65, 66, 72 and 88. Surveys were made of ponds involving 134 acres of topography in the Ware River watershed and about 10 acres in the Swift River watershed. Surveys were made for access roads at Shaft 9 of Quabbin Aqueduct and at Quabbin Hill. Periodic readings of the ground water level in numerous test wells were continued during construction operations at the main dam, and similar observations were continued at the dike. The engineering force supervised the work of lettering the monumental boulders placed at the ends of the dike, which work was completed September 26. Between April 6 and June 23 work was done on the layout and construction of a new entrance to Quabbin Park Cemetery by a labor force of the Commission. Monthly inspections and reports were continued of conditions found at all shaft heads along the Quabbin Aqueduct.

Storage buildings were made available near the group of administration buildings by the repair of existing farm buildings in the vicinity by the erection of some new buildings. A deep-well pump was installed and put in operation June 2 to supply water to the administration buildings from the well previously drilled under Contract 59 and now located under the repair shop. A compressed gas installation for the group of administration buildings was completed October 13.

The Department of Public Health continued its cooperation with this division in the analysis of samples of water. The chlorinator station on Mill Brook below the Central New England Sanatorium was maintained.

Quabbin Aqueduct and Ware River Intake Works

A two-ton gasoline-engine-driven multiple-speed hoist, with a lift of 465 feet, was installed at the Shaft 4 head house and completed November 14. The Ware River intake works were maintained ready for operation whenever required.

The 900-horsepower motor for driving the tunnel unwatering pump was lowered into the dry well at Shaft 1 on August 24 and the pump was used periodically thereafter for lowering the water level in the Wachusett outlet building to meet the requirements of the work under Contract 65, hereinafter described. On January 13 the tunnel was entered through Shaft 8 and inspected from the steel bulkhead to Shaft 4. The tunnel was entered at Shafts 9 and 12 at intervals for the purpose of reading weirs.

Rutland-Holden Sewer

Operation.—The Rutland-Holden Sewer was in continuous operation. The entire length of the line and the meter stations at the Rutland State Sanatorium,

at the U. S. Veterans Hospital in Rutland, and at the Holden-Worcester boundary line were inspected regularly, weirs and piezometer connections cleaned, records of flow maintained, and necessary repairs made.

Rutland-Center Sewer.—A sewerage system was designed for that portion of Rutland Center which can be drained by gravity into the Rutland-Holden Sewer. All house and cellar elevations and other appurtenant data were obtained and final locations of about 75 manholes and grades were established. Real estate plans were prepared. The area served is divided into three drainage systems, in addition to which a few short trunk lines to the main trunk sewer may be required. System A will in general drain Main Street east and Main Street west together with a loop northerly and westerly around Rutland Center Hill. Provision is made for a connection to take sewage from the Central New England Sanatorium. The sewer serving this district will be approximately 2.1 miles in length, and serve about 50 existing buildings, including the Jewish Sanatorium, Rutland Town Hall and High School. System B will in general drain Maple Avenue. The sewer will be approximately 0.7 mile in length, and serve about 34 existing houses. System C will in general drain Central Tree Road and a portion of Main Street in its vicinity. The sewer will be approximately 1.4 miles in length.

Holden-Center Sewer.—A sewerage system was designed for that portion of Holden Center which can be drained by gravity into the Rutland-Holden Sewer. All house and cellar elevations and other appurtenant data were obtained and final locations of about 98 manholes and grades were established. Real estate plans were prepared. The area served is divided into three drainage systems. System A will in general drain Laurelwood Road, Lovell Road, Walnut Street, Walnut Road, Armington Lane, Hubbard Lane, Highland Street to the summit, a portion of Reservoir Street, and Main Street between Highland Street and Lovell Road. The sewer serving this district will be approximately 1.7 mile in length and serve about 80 existing buildings. System B will in general drain Bancroft Street, Williams Street, Holt Road, Main Street between Highland Street and the easterly end of Boyden Road, Boyden Road, Bascom Parkway, Woodland Road, Phillips Road, and Highland Street between Armington Lane and Woodland Road. The sewer will be approximately 2.1 miles in length and serve about 101 existing buildings. System C will in general drain Salisbury Street north of the Boston & Maine Railroad, and Main Street between Salisbury Street and the easterly end of Boyden Road. The sewer will be approximately 0.6 mile in length and serve about 27 existing buildings.

Wachusett Watershed

Industrial Wastes.—Studies were continued of methods of disposal of manufacturing wastes in the Village of Jefferson in the Town of Holden.

Boylston and West Boylston Sewer.—Preliminary studies were made of the feasibility of collecting and diverting sewage from the towns of West Boylston and Boylston out of the Wachusett watershed.

Ware River Watershed

Maintenance.—A small labor force was employed throughout the year in caring for the grounds at the Ware River intake, Wachusett outlet and Shaft 4 and Shaft 9 head houses, setting stone bounds, reforestation and other miscellaneous work. The average number of men so employed was 6, the maximum being 15 during the week ending May 7.

Reforestation.—Reforestation in the Ware watershed was continued by the planting of transplants from the Commission's nurseries in the Swift River valley and from the State Nursery at Amherst during the spring planting season. The following table summarizes the Ware watershed planting to date:

Year	Species	Type	Quantity
1936	Norway Spruce	6-year transplants	106,560
	White “	5-year transplants	8,625
	“ “	4-year transplants	50,000
	European Larch	2-year seedlings	5,550
1937	White pine	4-year transplants	238,500
	Norway spruce	4-year transplants	42,250
	Black spruce	Mixed “ native seedlings	1,070
	Larch	“ “ “	363
1938	White pine	4-year transplants	30,000
	Red pine	4-year transplants	43,000
	European Larch	2-year seedlings	46,475
Total			572,393

Fire Protection.—Forest fire equipment continued to be housed in a building of the Commission near the intake works and was maintained in readiness for service at all times. Four assistants in the Coldbrook office were appointed as deputy fire wardens. The equipment and personnel responded during the year to calls for assistance at 5 forest fires which burned over a total area of 103 acres.

Quabbin Reservoir

Topography.—The taking of topography in the area below the flow line of the reservoir was continued. To date 34,358 acres or 53.7 square miles have been surveyed for the general topographic maps within and adjacent to the proposed reservoir. A small labor force was employed in connection with this work.

Policing.—Subsequent to the general taking and the discontinuance of towns in the reservoir area, police protection was provided in Enfield daily and in Dana Sundays, commencing May 15 and continuing until September 24. Barriers were then erected across all the main roads into the reservoir area with men stationed at all such points to prevent the general use of these roads.

Real Estate.—Properties described in applications by owners for sale of real estate were located, and when no surveys had been made, sketches showing the approximate location were prepared. Properties purchased or taken by eminent domain were plotted on the general property map as the deeds were received and surveys completed. Real estate surveys during the year cover 468 acres, making a total to date of 69,254 acres or 108.2 square miles. Of this total, 68,850 acres have been plotted on a scale of 1 inch=200 feet. The work of computing the general taking line and checking the final real estate taking lines was completed March 28, when the general taking was made.

Photography.—The photographing of buildings, cemetery lots, and construction was continued. During the year 1,175 photographs were taken of miscellaneous views and progress of construction at Quabbin Reservoir, 173 in the Ware River watershed, and 33 on the pressure aqueduct line.

Cemetery Removals.—Interments in Quabbin Park Cemetery and the general removal of bodies from existing cemeteries in the reservoir area were continued. The removal of bodies, headstones and monuments has been done with labor engaged directly for this work. Removals have been completed from Hamilton Cemetery in Shutesbury, Blue Meadow Cemetery in Belchertown, Cemetery Hill, Woodlawn, Church and Packardsville Church cemeteries in Enfield, Greenwich Cemetery in Greenwich, and Pelham Hollow and Isaac Linzie cemeteries in Prescott. Of the estimated total of 7,500 bodies to be removed, 6,180 have been removed to date. Removals during the year included the soldiers' monument and cannon from the common in Enfield, the Ballou monument, the war memorial and cannon from the common in Dana Center, and the wooden honor rolls from Enfield and Greenwich. These honor rolls are temporarily stored for safekeeping. A memorial tree was set in Quabbin Park Cemetery by the Town of Greenwich May 2.

Removals have been nearly completed from the remaining cemeteries located below the Quabbin Reservoir flow line as follows: Jason Powers Cemetery in Prescott, and Towne, Old North Dana and Pine Grove cemeteries in Dana.

During the year work progressed as shown in the following table:

CEMETERY REMOVALS		To Nov. 30, 1937*	Year Ending Nov. 30, 1938	Total
Burial lots in Quabbin Park Cemetery assigned in exchange		537	82	619
Burial lots in Quabbin Park Cemetery sold		28	6	34
Number of releases executed of rights	} to Q. P. Cemetery	528	83	611
in old lots in Quabbin Reservoir		263	6	269
area	} to other cemeteries			
Bodies removed from Quabbin Reser-		3703	1533	5236
voir area	} to other cemeteries	921	23	944
Bodies moved from area outside Quabbin Reservoir to				
Quabbin Park Cemetery		3	1	4
Burials, not reinterments, in Q. P. Cemetery		117	16	133
Headstones moved {to Q. P. Cemetery		2137	766	2903
Monuments moved {to other cemeteries		430	18	448
	} to Q. P. Cemetery	297	47	344
		148	1	149

*Includes corrections of previously reported data. Quabbin Park Cemetery was not completed for use until August 25, 1932, prior to which time 632 bodies had been removed to other cemeteries.

The vault was maintained and used from time to time during the winter months. Work of developing Quabbin Park Cemetery included the construction of a new entrance with memorial tablets set in stone gateposts and miscellaneous grading and seeding. Cemetery lots were graded and seeded as removals were completed, and in case of purchases, were graded and seeded at once. The hurricane of September 21 uprooted or broke off practically all of the large pine trees in the cemetery area, damaged several of the hardwood trees, and knocked down or damaged approximately 100 stones. Only three of these stones were damaged beyond repair, the remainder were straightened and reset. Felled trees were limbed and the logs cut in marketable lengths and sold. Stumps were pulled and holes refilled, and all brush burned. An investigation was made of the origin and purpose of all perpetual care funds deposited for the benefit of lots in the discontinued cemeteries. The average force employed on cemetery work during the year was 17 men, the maximum being 36 during the week ending April 23.

Fire Protection.—The fire-fighting equipment was maintained in readiness for service at all times. Eight assistants in the division office were reappointed as deputy fire wardens in the towns affected by the reservoir. The equipment and personnel responded during the year to calls for assistance at 14 forest fires which burned over a total area of about 307 acres. There also occurred a total of 5 fires in buildings, 4 of which were chimney fires resulting in little if any damage. A small labor force was employed to maintain a fire patrol until May 14. The clearing of a 40-foot fire line was continued throughout the year, and included the reclearing of these lines on account of trees blown down by the hurricane of September 21.

Lumbering.—Various lumbermen continued cutting operations under agreements with the Commission for the purchase of standing timber.

Reforestation.—The general program of reforestation was continued with stock from the Commission's nurseries. Watershed planting was started April 4 and completed May 2, on areas outside the flow line and on future islands in the reservoir area. The following table summarizes the Quabbin watershed planting to date not including 100,000 European larch 2-year seedlings used for replacement planting in areas originally planted with pine and Norway spruce in 1935 and 1936.

Year Planted	Species	Type of Transplants	Quantity	Acres Planted	Per Cent of Survival to Date	Cost per M for Planting
1935	White pine	3-year	242,795	420	65-75	\$4.50
	Red pine	3-year	257,600			
1936	Norway spruce	5-year	62,000	170	40-50	8.47
	Norway spruce	6-year	145,000			
1937	White pine	4-year	241,000	200	90-95	5.87
	Red pine	4-year	53,000			
1938	White pine	4-year	152,825	275	95-98	6.78
	Red pine	4-year	199,575			
	White spruce	4-year	12,350			
	Red spruce	4-year	9,950			
	Norway spruce	4-year	33,870			
Total			1,409,965	1,065		

The entire stock was removed from the Thurston Farm Nursery during the spring for planting on the watersheds of Quabbin Reservoir and Ware River and for transplanting in the permanent Belchertown Nursery.

General maintenance work and additional planting was done in the Belchertown Nursery. The following quantities of seed were planted and it is estimated that the number of seedlings and transplants now in this nursery is as follows, not including about 4,000 shrubs of various types:

Species	Pounds of Seed, 1938	1-Year Seedlings	2-Year Seedlings	3-Year Transplants
White pine	50	600,000	700,000	900,000
Red pine	30	600,000	1,000,000	1,300,000
White spruce	5	100,000	175,000	350,000
Red spruce	5	100,000	275,000	100,000
Norway spruce	5	75,000	250,000	175,000
European larch	25	300,000	300,000	10,000
Hemlock	10	50,000	5,000	30,000
Scotch pine	—	—	—	5,000
Total	130	1,825,000	2,705,000	2,870,000

Gypsy moth control work, March 7 to March 26, consisted of cutting and burning infested apple trees in open areas to be reforested.

A labor force of about 18 men was employed for about 37 weeks during the season of work in the nursery and on miscellaneous reforestation work. During the brief period of broad planting, the force used for this purpose averaged 40 men with a maximum of 57.

Clearing Area to be Flooded.—Clearing of about 530 acres extending along the bottom of the valley for about 1½ miles north of the main dam and east of the river was commenced July 1 and continued throughout the year, by a labor force of the Commission, to set a standard for such work to be done by contract on the remaining reservoir area, and to determine the proper cost of such work. The average number of men so employed was 24 the maximum being 44 for the week ending October 1.

Maintenance.—A labor force was employed throughout the year for miscellaneous maintenance work including maintenance of the completed Beaver Brook Dike and access roads. Following the general taking and the consequent discontinuance of the towns of Dana, Enfield, Greenwich and Prescott, janitor service was furnished for the Enfield schoolhouse until the close of the school year, the Enfield sewer system was repaired, highways maintained, and miscellaneous damage caused by the hurricane of September 21 repaired. The average number of men so employed was 13, the maximum being 32 for the week ending November 19.

Soil Testing Laboratory.—The work of exploring, collecting and testing materials to be used in the construction of the main dam together with current control tests of the quality of the material placed in this structure was continued. New equipment was added to the laboratory from time to time to expedite the work. Tests were principally of the permeability, stability and related characteristics of soils affecting their use in hydraulic-fill embankments. Samples from selected borrow areas were collected as required for preliminary testing to determine their suitability for use in the embankments.

Size-distribution analyses supplemented by permeability and porosity tests were used for the routine control of the quality of the beach and core materials placed by the full-hydraulic method in the construction of the main dam embankment. Samples were collected daily from the dry-box hopper for sizing tests. The water in the central pool was examined daily for turbidity, as was also the water in the settling basin into which fines from the core were wasted. Samples from the settled core were obtained periodically through the ports of the two observation wells and tested for size gradation and porosity to determine the extent of consolidation. Samples of the core material were also obtained periodically through the ports of the observation well in Beaver Brook Dike and similarly tested. A flush-joint sampler was designed for use in the observation-well work to collect undisturbed samples at a considerable distance from the well.

During the year 16,941 samples were collected, of which 14,458 were tested. Failure of electric power following the hurricane of September 21 was responsible for the large amount of testing awaiting completion. A small labor force was employed in the collecting and handling of samples.

Chemical and Bacteriological Laboratory.—The sampling and bacteriological examination of water supplies of the Commission's contractors and of miscellaneous supplies on property controlled by the Commission were continued. Regular samples have been collected and sampled from stations on the Ware, Swift, Quaboag and Chicopee rivers. In connection with the comprehensive sanitary survey of the watersheds of the Metropolitan District, under Chapter 48 of the Resolves of 1936, a program of sampling the rivers and their tributaries in the Wachusett and Sudbury watersheds and recording their flows was carried on. The Department of Public Health cooperated in testing methods of treating manufacturing wastes tributary to the Wachusett Reservoir in Holden. The laboratory supervised the treatment of fines wasted from the core pool in the construction of the main dam embankment. Studies and tests were made to determine the corrosive action of soils along the Sudbury River and Happy Hollow siphons on the Weston Aqueduct. A small labor force was employed in the collecting and handling of samples.

Progress of Contracts.

Contract 47.—Contract 47, with Vincent Cairn, for constructing the service building and the head house at Shaft 12 of Quabbin Aqueduct in the Town of Greenwich, was carried to completion by the finishing of miscellaneous small items.

The value of work included in contract estimates during the year was \$1,104.63, the final estimate dated January 4, 1938, being for \$35,744.73.

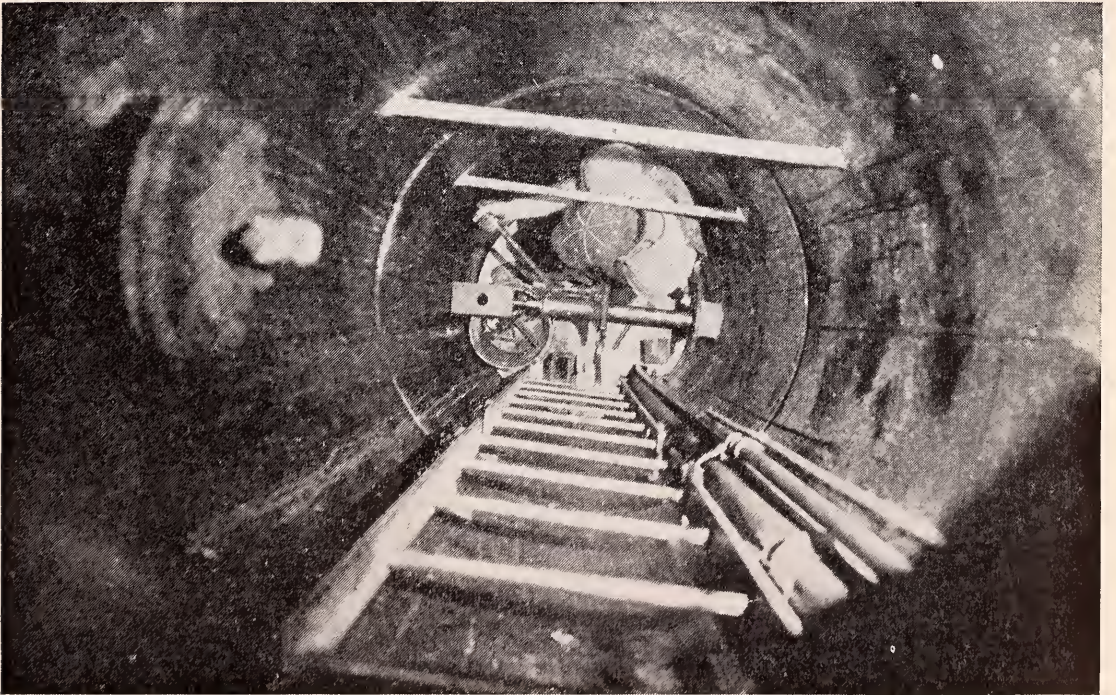
Contract 50.—Contract 50, with the Arthur A. Johnson Corporation, for constructing the embankment of the dike of Quabbin Reservoir in the towns of Enfield and Ware, was completed December 30, 1937, the work consisting of cleaning up the site.

The value of work included in contract estimates during the year was \$29,749.57, the final estimate dated November 9, being for \$1,402,751.98. The contractor's force averaged 23 men for a period of 5 weeks, the maximum being 36 for the week ending December 18, 1937.

Contract 52.—Contract 52, with Benjamin Foster Company, for constructing the embankment of the main dam of Quabbin Reservoir in the towns of Belcher-town, Enfield and Ware, was continued throughout the year. Before the resumption of hydraulic fill work in the spring, an examination of the core was made by transverse trenches and test pits to locate intrusions of coarse material washed in from the sides of the cut at the west abutment. To correct the conditions found, a trench was excavated about 4 feet wide, 4 feet deep and 700 feet long, 15 feet upstream from the center line of the dam, and unsuitable material in this trench was wasted and replaced by impervious material. The placing of hydraulic fill was resumed April 11. The gravity head from the hog box above the east abutment which had been satisfactory for the construction of the



CONTRACT 52.—Construction of Bridge Across Spillway Channel for Access Road to East End of Main Dam.



CONTRACT 52.—Looking Down One of the Observation Wells which Penetrate the Center of Both the Main Dam and the Dike. Sampling the Compactness of the Core Material.

lower portions of the dam during the preceding year was supplemented by a booster installed just below the hog box, consisting of the 1000-H.P. motor-driven 12,000-g.p.m. 20-inch dredge pump which had been used for a similar purpose in the construction of the dike under a previous contract. Pipe connections were made so that this booster, fed from one section of the hog box, could discharge into the sluice line to either beach. At first it was used only when working at the far ends of the beaches and by-passed the rest of the time. During the latter part of the season it was in continuous operation. The method of placing the hydraulic fill continued the same as last year with the following exceptions:

In August the excess of fines from the borrow pit became so great that the shallowness of the pool interfered with the suction of the barge pumps, and required the construction of a pipe line from the makeup pumps to the east end of the core pool near the pump suction, and the abandonment of the makeup line which had previously discharged at the west end only. The contractor commenced wasting fines August 31 by means of a 14-inch siphon pipe across the upstream beach near the west end and into a large settling basin about 30 feet deep in the lower portion of last year's borrow pit. This furnished a very large settling capacity and did not overflow until late in October. Another settling basin was then constructed in shallow areas along the side of the river which prevented the discharge of unsettled material into the river. The lower basin was sprayed with aluminum sulphate to precipitate the suspended matter, and the effluent of the upper basin was dosed with an alum solution of about 120 parts per million. In addition to wasting fines, the contractor trucked onto the beaches coarse material consisting of cobbles rejected from the belt conveyors in the borrow areas and of materials excavated from the spillway channel and from a gravel borrow pit south of the spillway.

In order to carry the fill as high as possible by hydraulic methods and to leave additional material on the dam to help bring it to its final grade, the contractor was permitted to temporarily steepen the slopes of the fill above elevation 500. About 20,000 cubic yards of excess fill were thus placed on the slopes to be later picked up with dragline excavators to help top out the structure. The two observation wells for sampling the consolidation of the core were carried up ahead of the fill and all but the top 8-foot steel section of each steel well was placed.

On working days after April 10, there was placed an average of about 7,855 cubic yards per day, the maximum being about 14,500 cubic yards on May 9, and the hours of plant operation averaging about 18. The hydraulic fill portions of the embankment were completed November 24, when operations were shut down for the winter except for preparations to dismantle the hydraulic fill plant. About 1,437,500 cubic yards of hydraulic fill were placed during the year, making a total of 3,402,200 cubic yards including 123,500 cubic yards of selected coarse material for the upstream face.

After the plant shutdown in 1937, the contractor rearranged his equipment so as to secure all his hydraulic fill borrow from the till deposits in the high-level borrow pit about three quarters of a mile northeast of the dam site. The belt conveyor system of the preceding year, except for the main conveyor, was moved to the new location. A dry-box hopper was built in the new area and the till-pit conveyor run from it downhill to discharge onto the lower section of the previous year's main conveyor. A shaker screen was installed at this point to remove large rocks. The new dry box had a trestle from which scraper wagons and shovel-loaded trucks dumped onto coarse racks over a hopper from which the material was fed onto the till-pit conveyor by a short feeder belt. Rejects from the coarse rack were discharged into narrow-gage cars or trucks and were hauled to a waste dump. The dry box was fed by six scrapers and by trucks which were loaded by shovels moved about the pit as necessary to obtain the required quality of material to supplement that excavated by the shovel feeding the swing conveyor. The swing conveyor was similar to that used the previous year except that the units of the supporting trestle consisted of trusses forming a U-shaped section with the conveyor belt in the center and the movable racks riding on rails on the tops of the legs of the U.

At the same time that changes were made in the conveyor system the first of the year, the shuttle conveyor at the hog box was replaced by a wooden trough discharging into either side of the hog box, and powerful jets of water washed the material discharged from the main conveyor down this trough. In the latter part of the season the pump barge in the pool was dismantled and the pumps moved onto a smaller float. In general, the contractor worked three shifts daily and a six-day week on the hydraulic fill and operations closely connected with it, using Sunday for repairs and changes.

After sluicing of the previous year was stopped for the winter, jetting in the pool was continued until January 9 by mounting the jetting rig on runners and working through the ice. When sluicing was resumed, the contractor experimented with a scarifier behind a boat in an attempt to eliminate the necessity for jetting. This did not prove satisfactory and jetting was resumed May 12 and continued until August 3, when the pool became so shallow that the rig could not be floated. Later the rig was rebuilt and jetting was again resumed from November 4 until the end of the sluicing season.

Crushed stone was obtained by crushing and washing rejects from the belt conveyor system. About 10,500 cubic yards were thus furnished and placed in the blanket under the riprap protection of the upstream face. Some of the cobbles and boulders rejected from the conveyor system were trucked onto the upstream face for use as riprap but the greater part of the riprap placed during the year came from the spillway excavation. At the beginning of the year the contractor had constructed a coarse rack against the fill for the access road to the outlet works below the dam. The rejects were carried by narrow-gage cars across the east abutment and along the upstream levee and were placed as riprap by a crane which picked the bodies off the cars and dumped them. As the embankment was built up a trestle across the east abutment was constructed at a higher elevation and rock excavated from the spillway was chuted into trucks and hauled to the upstream face as riprap. Selected loads of material from the spillway ledge excavation were trucked by way of the main highway to the west end and placed without passing over racks.

Soil dressing was placed on the downstream slope commencing in June. Material was stripped by power shovel from suitable fields, trucked to the berm at elevation 460, dumped off the edge of the berm, spread by small bulldozer and fine graded by hand. By October most of the slope between this berm and the road to the outlet works was completed and seeded. A total of 4,500 cubic yards of soil dressing was placed in this area, and 2.8 acres seeded.

During the period from May 9 to October 26, progress was made on the construction of drop inlets and the laying of pipe in the drainage system on the downstream face and a paved gutter was completed along the intersection of the downstream slope of the dam with the hill at the west end below the berm at elevation 500.

In May the contractor completed the wing walls of the intermediate intake on the upstream face. In July he resumed work on the shaft structure and by August the embankment was high enough to allow him to start the wing walls of the upper intake. These walls were constructed by laying up three courses of stone masonry, building the back form, filling the intervening space with concrete and then repeating the process. Concrete was mixed in a paver on the upstream levee of the hydraulic fill and placed with a bottom-dump bucket handled by a crane. The wing walls were completed and cap stones set October 29. The main portion of the shaft was only three feet below the intake structure floor level at elevation 536 on November 24, when snow and cold weather necessitated shutting down for the season. During the year 1,265 cubic yards of concrete and 182 cubic yards of stone masonry were placed.

Excavation for the spillway channel was continued. The cut through to the face of the cliff, just south of the access road bridge is now well defined but not down to grade for the entire length. In August the contractor built a temporary road down the east slope of the spillway cut at the old Bondsville-Enfield road and excavated ledge in the lower section of the spillway carrying about 100 feet of this cut down to grade. About 30,000 cubic yards of ledge and 6,000 cubic yards of earth were excavated from the spillway channel during the year.

Gypsum planking was continued in the first and second floors and roofs of the residences and the roof of the main building and completed February 24. Gypsum plank roofs were covered with slate roofing and completed April 15. The concrete roof of the patrol building (boathouse and hangar) was covered with a waterproof membrane embedded in hot asphalt beneath the bituminous paving and was completed July 27. Corkboard insulation was applied to all exterior walls above the basement in the residences and main building and to the ceilings of the boathouse and hangar. Metal lath was installed on the corkboard on all exterior walls, and on furring in ceilings in the residences and the top floor of the main building. Plastering was completed July 15. The second floor ceilings of the residences and third floor ceilings of the main building were insulated with mineral wool and completed May 14.

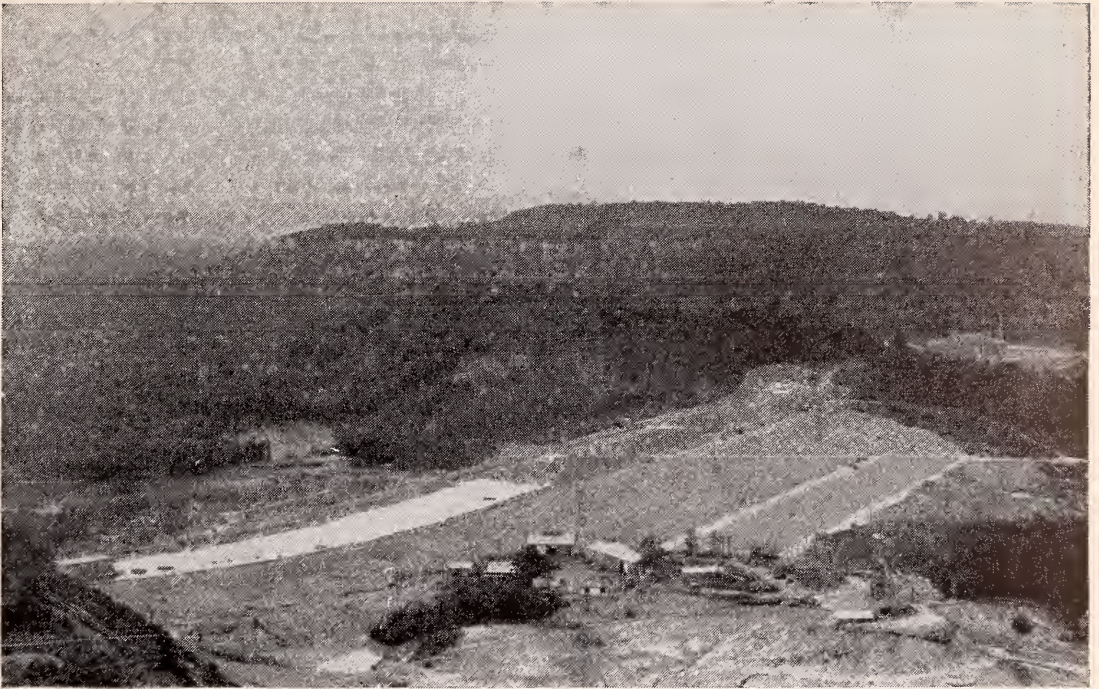
The electrically-operated hangar door was delivered July 6 and erection was completed July 20. Erection of overhead doors in the garages was completed April 15. Laying of rubber floor tile in the residences and asphalt tile and linoleum in the main building was completed October 25. Hardwood floors were laid in the dinings rooms, living rooms, studies and entire second floors of the residences and completed October 19.

The automatic sprinkler system, including a wet pipe system in the main building, dry pipe systems in the garages, boathouse and machine shop, and a deluge system in the hangar, was completed August 5, and the necessary compressed air system was completed at the end of the year. The hot water storage tank, oil-burning hot water heater and gas lines to the laboratory were completed August 16. The heating system, consisting of one coal-burning and one oil-burning boiler, and steam lines to blower units in the boathouse and hangar, and to radiators elsewhere, was completed at the end of the year. The electrical installation, including transformers, switchboard, auxiliary power plant and telephone equipment, was completed at the end of the year. The entire work including grading and seeding and bituminous road surfacing, erecting two flagpoles and other miscellaneous accessories was practically completed at the end of the year.

The value of work included in contract estimates during the year was \$285,956.27, or a total to November 29, the date of the latest estimate, of \$379,384.39, of which \$356,445.95 was approved for payment. The contractor's force averaged 36 men, the maximum being 83 for the week ending December 4, 1937.

Contract 60.—Bids were opened December 2, 1937, for constructing access roads to Shaft 12 of Quabbin Aqueduct, in the towns of Hardwick and Greenwich. Twenty-two bids were received, ranging from \$78,348.00 to \$145,894.10. The contract was executed January 6 with Middlesex Construction Company, Framingham, Mass., the lowest bidder. The work contracted for consists of a main access road, surfaced with bituminous macadam 20 feet in width, extending easterly from the tunnel intake works at Shaft 12 in the town of Hardwick 2.05 miles to a junction with existing town roads leading to Ware and Hardwick, and of a branch road surfaced with gravel 13 feet in width, extending from the main road across the baffles constructed under Contract 51, to provide access for inspection and fire protection purposes to a large area which would otherwise be isolated north of the East Branch Baffle. This branch road is 0.54 mile long not including the length across the top of the baffles, and has one traffic lane with turnouts permitting passage of two vehicles at intervals of a few hundred feet.

Clearing and grubbing started January 10 and was completed January 28 and rough grading started March 14 and was completed June 10. The macadam surface was constructed on a gravel foundation 12 inches thick which was placed June 4 to 24. The macadam consists of two courses of broken stone, the bottom course $3\frac{1}{2}$ inches bound with sand and the top course $2\frac{1}{2}$ inches penetrated with hot asphalt at the rate of two gallons per square yard, sealed with asphalt at the rate of $\frac{3}{8}$ gallons per square yard and bound with $\frac{1}{2}$ -inch broken stone. Broken stone was purchased and trucked to the job except for a small amount of tunnel spoil obtained at Shaft 12 and used in the bottom course. The bottom and surface broken stone courses were completed July 27; and the asphalt penetration, August 3. Berm ditches were excavated beyond tops of side slopes in cuts, and all cut slopes and some embankment slopes were rounded, loamed and



CONTRACT 52.—The Main Dam Looking Downstream, when the Embankment had Reached an Elevation 28 Feet Below the Future Flow Line of Quabbin Reservoir. Group of Administration Buildings at Extreme Right.



CONTRACT 60.—Access Road to Shaft 12 on the West Shore Line of the Reservoir at the Entrance to Quabbin Aqueduct.

seeded to reduce future maintenance due to slop erosion. Loam berms were constructed at the shoulders of high embankment slopes as in similar cases under previous contracts. Loam borrow was completed September 27. All work of the contract was completed October 18. This contractor also placed the macadam surface at the memorial gateway to Quabbin Park Cemetery.

The value of work included in contract estimates to October 15, the date of the latest estimate, was \$74,682.13, of which 85 per cent was approved for payment. The contractor's force averaged 23 men for a period of 35 weeks, the maximum being 37 for the week ending June 25.

The principal items of plant equipment were as follows:

- 3 Power shovels
- 2 Bulldozers
- 1 Power grader
- 3 Rollers
- 2 Trench diggers
- 11 Trucks, miscellaneous pumps, etc.

The total work done and materials furnished to date under the principal items of Contract 60 are as follows:

Clearing and grubbing	24	acres
Roadway earth excavation	43,800	cu. yds.
Ledge excavation	1,900	" "
Ordinary borrow	12,000	" "
Broken stone for surface course	3,750	tons
Broken stone for base course	2,375	cu. yds.
Bituminous material	62,200	gals.
Gravel borrow	12,360	cu. yds.
Fine grading, rolling and finishing	72,000	sq. yds.
Trench excavation	2,385	cu. yds.
Loam borrow	8,000	" "
Loam berms	1,350	lin. ft.
Peat excavation	1,850	cu. yds.
Boulder guard rail	7,150	lin. ft.
12 to 36-inch reinforced concrete pipe	2,031	" "
6-inch side drains	2,910	" "

Contract 61.—Bids were opened October 3, for clearing a portion of the site of Quabbin Reservoir on the West Branch of the Swift River in the towns of Belchertown and Pelham, Shutesbury, New Salem and Ware, including areas which were in the former towns of Enfield and Prescott. This is a PWA contract. Five bids were received ranging from \$268,700.00 to \$482,825.00. The contract was executed October 20, with Coleman Bros. Corp., Boston, Mass., the lowest bidder. The work contracted for consists of clearing the entire West Branch and the main valley west of the Village of Enfield, except a portion at the bottom of the valley lying east of the river and upstream from the main dam which is being cleared by a labor force of the Commission. Work was started November 1. Only a small amount of clearing was done and no estimate for payment was made before November 30.

Contract 62.—Bids were opened October 3, for clearing a portion of the site of Quabbin Reservoir on the Lower Middle and East branches of the Swift River in the towns of Ware, New Salem, Petersham and Hardwick, including areas which were in the former towns of Enfield, Prescott and Greenwich. This is a PWA contract. Five bids were received ranging from \$344,100.00 to \$550,825.00. The contract was executed October 20 with Coleman Bros. Corp., the lowest bidder. The work contracted for consists of clearing the lower portion of the reservoir north of the dike, east of the Village of Enfield, and south of Greenwich Village. Work was started November 1. Only a small amount of clearing was done and no estimate for payment was made before November 30.

Contract 63.—Bids were opened October 3, for clearing a portion of the site of Quabbin Reservoir on the central portion of the Middle Branch of the Swift River in the towns of New Salem, Petersham and Hardwick, including areas which were in the former towns of Greenwich, Prescott and Dana. This is a PWA contract. Six bids were received ranging from \$217,500.00 to \$350,975.00. The contract was executed October 20, with Coleman Bros. Corp., the lowest bidder. The work contracted for consists of clearing a portion of the Middle Branch of the reservoir, extending about four miles northerly from Contract 62. Work was started November 1. Only a small amount of clearing was done and no estimate for payment was made before November 30.

Contract 64.—Bids were opened August 25, for constructing the service buildings at Shafts 1 and 8 of Quabbin Aqueduct in the towns of West Boylston and Barre. Subsequently, each of the three lowest bidders agreed to accept his bid price if the necessary provisions were added to the contract to make it a PWA contract. The contract was executed as a PWA contract October 25 with Platt Contracting Co., Inc., Cambridge, Mass., the lowest bidder. The work contracted for consists of constructing a service building adjacent to the existing Wachusett outlet building at Shaft 1 of Quabbin Aqueduct, containing space for garaging two trucks, storeroom, public toilets and a heating plant which can serve the shaft outlet building as well as the service building, also a service building adjacent to the existing Ware River intake building at Shaft 8 of Quabbin Aqueduct, containing garage space for three trucks or automobiles, greasing pit, storeroom and public toilets.

Work started November 7. At Shaft 1, excavation and placing of forms for footings and sidewalls were completed November 21, and reinforcing placed in the sidewalls November 30. Other miscellaneous items were in progress. At Shaft 8 similar work was done, reinforcing being in place November 23 and the footings poured November 30. The contractor's force averaged 12 men for a period of 4 weeks, the maximum being 17 for the week ending November 19.

No estimate for payment was made before November 30.

Contract 65.—Bids were opened September 8, for installing shaft caps and aqueduct control valves and for constructing appurtenant works in the Wachusett outlet building at Shaft 1 of Quabbin Aqueduct in the Town of West Boylston. Five bids were received, ranging from \$11,335.00 to \$22,685.10. The contract was executed September 22 with the Engineering Service and Construction Co., Boston, Mass., the lowest bidder. The work contracted for consists of installing gates and appurtenances for which provisions were made in the original design of the outlet works, and which are necessary to control and regulate the flow in the aqueduct, to shut off the discharge into Wachusett Reservoir and cause the water diverted from the Ware River to flow westerly in the tunnel to Quabbin Reservoir.

Prior to the contractor's work, the Commission commenced the unwatering operations by installing temporary transformers and lowering its 900-horsepower motor to the bottom of the dry well connecting it to the tunnel unwatering pump. Pumping was started September 6 and continued intermittently as necessary for the work of the contract. The contractor commenced work October 18. Stop logs were placed and sealed and a small gasoline-driven pump was used to complete the unwatering of the outlet chamber to permit thorough cleaning of rock.

The building's bronze entrance doors and frame were removed and temporary wooden doors substituted October 28. The two 72-inch Dow-disc valves, furnished by the Commission, were delivered November 3 and 4, lowered into the pit the next day, placed to line and grade and finally set in concrete November 19. Other work was in progress. The contractor's force averaged 6 men for a period of 7 weeks, the maximum being 8 for the week ending November 19.

No estimate for payment was made before November 30.

Contract 66.—Bids were opened August 25, for constructing regulating dams on the Middle Branch of the Swift River in the Town of New Salem and on the East Branch of the Swift River in the Town of Hardwick and in the former Town of Dana, now Petersham. Eleven bids were received, ranging from \$171,650.00 to \$294,250.00. Subsequently, each of the three lowest bidders agreed to accept his bid price if the necessary provisions were added to the contract to make it a PWA contract. The contract was executed as a PWA contract October 25 with C. & R. Construction Company, Boston, the lowest bidder. The work contracted for consists of the construction of regulating dams to maintain a practically constant water level over shallow areas in the upper branches of Quabbin Reservoir and of clearing the entire area to be flooded thereby. Work was started November 7 with clearing on the west side of the East Branch of the Swift River. The contractor's force averaged 28, the maximum being 45 for the week ending November 19.

No estimate for payment was made before November 30.

Contract 72.—Bids were opened October 3, for clearing a portion of the site of Quabbin Reservoir on the Upper Middle and East branches of the Swift River in the towns of New Salem, Petersham and Hardwick, including areas which were in the former towns of Prescott, Greenwich and Dana. This is a PWA contract. Four bids were received, ranging from \$469,975.00 to \$905,000.00. The contract was executed October 25 with C. & R. Construction Company, the lowest bidder. The work contracted for consists of clearing two portions of Quabbin Reservoir lying north and east of Contract 63, and downstream from the regulating dams to be built under Contract 66. Work of clearing and burning up was started November 7. The contractor's force averaged 49, the maximum being 78 for the last week of the year.

No estimate for payment was made before November 30.

Contract 88.—Bids were opened November 3, for furnishing and storing top soil at the Quabbin Dike and in the Quabbin Park Cemetery in the Town of Ware. Five bids were received, ranging from \$7,620.00 to \$12,500.00. The contract was executed November 3 with Warner Bros. and Goodwin, Inc., Sunderland, Mass., the lowest bidder. About 2,400 cubic yards of loam was stripped from borrow areas in Enfield and piled ready for removal to the storage areas November 15 to 21, when work was suspended for the season. The work was done by one man operating a Diesel-powered bulldozer.

No estimate for payment was made before November 30.

LIST OF DRAWINGS AND TABLES APPENDED HERETO

Location of Real Estate Acquired for Quabbin Reservoir.
 Takings of Real Estate and Water Rights.
 Status of Contracts Completed between November 30, 1937, and November 30, 1938.
 Status of Contracts in Force on November 30, 1938.
 Canvass of Bids, Contracts 61 and 62.
 Canvass of Bids, Contracts 63 and 72.
 Canvass of Bids, Contract 66.
 Canvass of Bids, Contract 73.
 Hydrographs of the Gréat Floods of March, 1936, and September, 1938.
 Monthly Rainfall at Stations on Ware and Swift Watersheds, 1938.
 Substitute Highways in Quabbin Reservoir Area.
 Revised Town and County Lines in Quabbin Reservoir Area.

For data on contracts completed prior to November 30, 1937, see sixth to twelfth annual reports, inclusive. A General Plan and Profile of the Present and Proposed Metropolitan Water Supply was included in the geological report appended to the 1935 annual report.

For summaries of rainfall for years previous to 1938, see 1935 to 1937 annual reports, inclusive.

Respectfully submitted,

FRANK E. WINSOR, *Chief Engineer.*

20 SOMERSET STREET, BOSTON, MASS.
 January 3, 1939.

FINANCIAL STATEMENT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION

EXPENDITURES AND DISBURSEMENTS FOR THE FISCAL YEAR AND FROM JULY 28,
1926, THE DATE OF THE APPOINTMENT OF THE COMMISSION

New accounts have been opened during the year necessitating transfers from
old accounts.

In the case of accounts marked PWA, the cost to the Commonwealth will be
decreased by the amount of the federal grant.

GENERAL OVERHEAD

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
<i>ADMINISTRATION, Commissioners' Office:</i>		
Salaries, Commissioners	\$10,500.00	\$127,915.56
Salaries, Clerical	14,527.66	142,076.33
General Legal Expense	3.00	2,172.16
Furniture and Fixtures	314.40	4,883.60
Engineering Instruments	00.00	98.00
Rent and Upkeep	2,282.53	27,583.17
Automobile Purchase	00.00	2,917.93
Automobile Maintenance	313.35	3,597.78
Miscellaneous Expense (undistributed)	2,557.28	19,759.58
Advertising	1,233.83	12,245.40
Printing and Blueprinting	797.88	11,495.38
Stationery and Office Supplies	478.15	3,541.39
Postage	328.08	1,955.13
Total Administration, Commissioner's Office	\$33,336.16	\$360,241.41
<i>ENGINEERING, Headquarters' Office:</i>		
Salaries, Engineering	\$78,810.80	\$944,476.17
Salaries, Clerical	11,628.41	118,427.54
General Consultant Expense	1,653.25	118,168.50
General Legal Expense	00.00	53,160.29
Furniture and Fixtures	62.07	15,181.51
Laboratory Equipment	00.00	1,961.00
Laboratory Supplies	00.00	2,071.94
Rental of Equipment	00.00	3,370.02
Engineering Instruments	8.33	1,266.37
Rent and Upkeep of Boston Office	10,372.66	126,425.92
Rent and Upkeep of Springfield Laboratory	00.00	3,950.54
Automobile Purchase	00.00	3,604.62
Automobile Maintenance	315.24	4,484.40
Special Experiments	00.00	2,304.63
Miscellaneous Expense (undistributed)	779.67	23,594.50
Printing and Blueprinting	753.19	16,908.58
Stationery and Office Supplies	604.89	6,968.60
Postage	363.00	2,704.48
Total Engineering, Headquarters' Office	\$105,351.51	\$1,449,029.61

Year ending
Nov. 30, 1938

Total to
Nov. 30, 1938

DISTRIBUTION OF GENERAL OVERHEAD

ADMINISTRATION, *Commissioners' Office*:

Wachusett-Coldbrook Tunnel	\$8,719.48	\$87,123.78
Coldbrook-Swift Tunnel	49.94	29,800.95
Quabbin Reservoir (except PWA)	15,513.52	154,006.67
Main Dam	7,099.00	46,606.48
Beaver Brook Dike	468.12	28,584.61
Southern Sudbury Emergency Supply	00.00	8,690.28
Metropolitan System-General (Expenditures under Chapter No. 48)	355.91	2,789.67
Cochituate Supply (Expenditures under Chapter No. 18)	00.00	1,508.78
Wachusett Watershed Protection	1,130.19	1,130.19
Quabbin Reservoir (PWA)	84.18	84.18
Weston Aqueduct Siphons	4.54	4.54
Pressure Aqueduct West of High Level Distributing Reservoir	23.26	23.26

Total Administration, Commissioners' Office \$33,448.14 \$360,353.39

ENGINEERING, *Headquarters' Office*:

Wachusett-Coldbrook Tunnel (except PWA)	\$27,226.10	\$340,478.84
Coldbrook-Swift Tunnel	217.29	113,977.89
Quabbin Reservoir (except PWA)	48,789.99	668,531.91
Main Dam	23,415.11	163,946.66
Beaver Brook Dike	1,525.96	106,571.66
Southern Sudbury Emergency Supply	00.00	33,407.97
Metropolitan System-General (Expenditures under Chapter No. 48)	1,926.17	15,805.54
Cochituate Supply (Expenditures under Chapter No. 18)	00.00	4,058.25
Wachusett Watershed Protection	2,250.89	2,250.89
Superstructure—Shaft 4—Southboro Tunnel	101.89	101.89
Wachusett-Coldbrook Tunnel (PWA) Service Buildings	74.36	74.36
Quabbin Reservoir (PWA)	1,347.60	1,347.60
Weston Aqueduct Siphons	2,585.39	2,585.39
Pressure Aqueduct West of High Level Distributing Reservoir	10,708.87	10,708.87
High Level Distributing Reservoir in Weston	70.97	70.97
Pressure Aqueduct East of High Level Distributing Reservoir	428.37	428.37

Total Engineering, Headquarters' Office \$120,668.96 \$1,464,347.06

WACHUSETT-COLDBROOK TUNNEL SECTION OF QUABBIN AQUEDUCT,
WARE SUPPLY (EXCEPT PWA)

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$8,719.48	\$87,123.78
Engineering, Headquarters' Office	27,226.10	340,478.84
Total General Overhead	\$35,945.58	\$427,602.62

Year ending
Nov. 30, 1938Total to
Nov. 30, 1938

ENGINEERING:

Salaries, Engineering and Clerical	\$2,855.26	\$401,358.85
Consultant Expense	503.13	8,478.00
Labor	614.79	4,652.12
Furniture and Fixtures	0.77	2,307.72
Engineering Instruments	30.56	7,727.80
Rent and Upkeep	1,038.21	19,759.53
Automobile Purchase	00.00	11,578.89
Automobile Maintenance	200.19	15,846.63
Contracts for Investigations and Surveys	00.00	18,640.69
Miscellaneous Expense (undistributed)	171.52	10,157.62
Advertising	00.00	6.05
Printing and Blueprinting	84.47	1,218.17
Stationery and Office Supplies	26.87	3,100.16
Postage	8.94	462.26
 Total Engineering	 \$5,534.71	 \$505,294.49

REAL ESTATE—General Construction:

Legal and Expert Expense	\$00.00	\$6,205.35
Consultant Expense	00.00	455.66
Labor	00.00	1,711.20
Miscellaneous Expense (undistributed)	00.00	1,003.60
Printing and Blueprinting	00.00	62.36
Purchases and Settlements	00.00	123,347.50
Taxes	00.00	3,682.24
Maintenance of Real Estate	00.00	1,298.18
Police Protection		
Labor	00.00	41.00
Fire Protection		
Equipment	00.00	1,254.66
Miscellaneous Expense	00.00	00.54
Special Agents		
Salaries	00.00	12,949.00
Furniture and Fixtures	00.00	117.67
Automobile Purchase	00.00	1,222.50
Automobile Maintenance	00.00	2,124.30
Miscellaneous Expense (undistributed)	00.00	1,201.73
Printing and Blueprinting	00.00	26.51
Stationery and Office Supplies	00.00	5.48
Postage	00.00	21.36
 Total Real Estate	 \$00.00	 \$156,730.84

WARE WATERSHED PROTECTION:

Salaries, Engineering and Clerical	\$9,970.55	\$146,115.43
Legal and Expert Expense	814.22	27,853.16
Consultant Expense	00.00	763.70
Labor	4,342.33	19,244.87
Engineering Instruments	8.55	415.65
Rent and Upkeep	139.90	554.51
Furniture and Fixtures	0.26	63.18
Completed Contracts Nos. 27 and 39	00.00	243,104.18
Automobile Purchase	—60.00	1,182.53
Automobile Maintenance	800.61	6,273.41
Special Experiments	00.00	700.00
Compensation to Labor for Injuries	00.00	774.85

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Medical and Surgical Supplies	00.00	200.00
Medical and Surgical Services	11.00	11.00
Miscellaneous Expense (undistributed)	169.69	5,921.69
Printing and Blueprinting	119.82	846.66
Stationery and Office Supplies	127.47	502.32
Advertising	00.00	2.00
Postage	23.54	74.09
Installed Equipment	00.00	5,610.75
Rental of Equipment	00.00	2.50
Purchases and Settlements	19,741.10	1,360,724.91
Taxes	5,054.54	53,099.42
Maintenance of Real Estate	1,516.21	10,829.49
Special Agents		
Salaries	2,520.00	12,168.67
Automobile Purchase	856.67	1,478.67
Automobile Maintenance	418.21	2,335.29
Miscellaneous Expense (undistributed)	255.48	1,465.74
Printing and Blueprinting	00.00	167.40
Stationery and Office Supplies	4.20	8.11
Postage	00.00	23.55
Labor	00.00	15.00
Police Protection		
Labor	00.00	64.00
Fire Protection		
Equipment	00.00	39.09
Labor	147.35	147.35
Auto Maintenance	4.25	4.25
Miscellaneous Expense	0.78	0.78
Rutland-Holden Sewer, Maintaining, Cleaning and Repairing State Sanatorium Branch	55.92	533.99
U. S. Vet. Hospital Branch	65.76	582.46
Trunk Sewer, except Branches	213.24	1,504.40
Use of City of Worcester's Sewerage System for Disposal of Sewage from Rutland- Holden Sewer	402.46	1,177.56
Reforestation, Watershed Planting		
Trees for Watershed Planting	00.00	1,521.89
Labor	1,009.19	1,009.19
Fire Stops and Fire Access Roads	2,794.43	2,794.43
Total Ware Watershed Protection	\$51,527.73	\$1,911,912.12

WARE DIVERSION DAMAGES—EXCEPT AWARDS BY COURT DECREE:

Salaries, Engineering and Clerical	\$1,664.08	\$86,338.33
Legal and Expert Expense	00.00	3,177.15
Consultant Expense	00.00	22,537.61
Labor	61.20	2,495.68
Furniture and Fixtures	00.00	30.73
Laboratory Equipment	7.19	287.30
Laboratory Supplies	30.75	464.19
Engineering Instruments	00.00	560.34
Rental of Equipment	00.00	203.75
Rent and Upkeep	46.30	90.49
Automobile Purchase	0.50	170.92
Automobile Maintenance	29.76	4,030.41
Medical and Surgical Supplies	0.25	0.25
Contracts for Investigations and Surveys	00.00	63.27
Materials of Construction	00.00	136.51

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Miscellaneous Expense (undistributed)	6.53	7,345.99
Printing and Blueprinting	00.00	1,261.10
Stationery and Office Supplies	00.00	64.10
Postage	00.00	6.62
Purchases and Settlements	00.00	196,633.33
<hr/>		
Sub Total Ware Diversion Damages— Except Awards by Court Decree	\$1,846.56	\$325,898.07

WARE DIVERSION DAMAGES—AWARDS BY COURT DECREE:

JURY VERDICTS:

Salaries, Engineering and Clerical	\$00.00	\$61,087.46
Legal Expense	00.00	37,806.71
Consultant and Engineering Expert Expense	00.00	92,969.39
Expert and Other Witness Expense	00.00	63,740.91
Automobile Maintenance	00.00	440.58
Miscellaneous Expense (undistributed)	00.00	7,526.44
Printing and Blueprinting	00.00	682.98
Stationery and Office Supplies	00.00	146.83
Postage	00.00	19.63
Settlements	00.00	260,000.00
Payments under Certificates of Judgment	00.00	560,458.62
<hr/>		
Sub Total Ware Diversion Damages— Awards by Court Decree—Jury Verdicts	\$00.00	\$1,084,879.55

WARE DIVERSION DAMAGES—PAYMENTS TO COUNTIES FOR RE-IMBURSEMENT FOR EXPENSES OF LITIGATION IN COUNTY COURTS:

County of Hampshire	\$00.00	\$15,000.00
Total Ware Diversion Damages	\$1,846.56	\$1,425,777.62

PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:

Completed Contracts	\$00.00	\$9,629,739.99
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PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:

Engineering Instruments	\$17.40	\$17.40
Installed Equipment	1,516.90	64,583.33
Temporary Equipment	00.00	6,423.60
Labor except Contracts	665.34	5,081.03
Compensation to Labor for Injuries	\$00.00	\$18.29
Contracts for Equipment for Surveys	00.00	898.34
Maintenance of Partially Completed Structures	4,176.43	15,751.03
Maintenance of Grounds	29.25	5,643.94
Purchases of Plants, Trees and Shrubbery	00.00	842.58
Rental of Equipment	00.00	7.00
Miscellaneous Expense (undistributed)	475.29	9,929.13
Printing and Blueprinting	51.54	51.54
Stationery and Office Supplies	1.71	1.71
Materials of Construction	00.00	25.87
<hr/>		
Sub Total Except Construction Contracts	\$6,933.86	\$109,274.79
Total Permanent Construction	\$6,933.86	\$9,739,014.78
Total Wachusett-Coldbrook Tunnel Section of Quabbin Aqueduct, Ware Supply (except PWA)	\$101,788.44	\$14,166,332.47

Year ending
Nov. 30, 1938Total to
Nov. 30, 1938

WACHUSETT-COLDBROOK TUNNEL (PWA ONLY) SERVICE BUILDINGS

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$00.00	\$00.00
Engineering, Headquarters' Office	74.36	74.36
	<hr/>	<hr/>
Total General Overhead	\$74.36	\$74.36

ENGINEERING:

Salaries, Engineering and Clerical	\$671.72	\$671.72
Consultant Expense	32.48	32.48
	<hr/>	<hr/>
Total Engineering	\$704.20	\$704.20
Total Wachusett-Coldbrook Tunnel, Service Buildings (PWA)	\$778.56	\$778.56
TOTAL WACHUSETT-COLDBROOK TUNNEL, WARE SUPPLY	\$102,567.00	\$14,167,111.03

WACHUSETT WATERSHED PROTECTION

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$1,130.19	\$1,130.19
Engineering, Headquarters' Office	2,250.89	2,250.89
	<hr/>	<hr/>
Total General Overhead	\$3,381.08	\$3,381.08

ENGINEERING:

Salaries, Engineering and Clerical	\$7,085.86	\$12,628.39
Legal Expense	167.92	171.47
Labor	619.37	1,319.61
Engineering Instruments	9.00	9.00
Automobile Maintenance	264.07	464.25
Miscellaneous Expense (undistributed)	258.91	524.84
Printing and Blueprinting	29.84	49.75
Stationery and Office Supplies	17.59	17.59
Postage	6.79	12.74
Rent and Upkeep	38.50	38.50
Medical and Surgical Services	206.00	206.00
	<hr/>	<hr/>
Total Engineering	\$8,703.85	\$15,442.14
TOTAL WACHUSETT WATERSHED PROTECTION	\$12,084.93	\$18,823.22

COLDBROOK-SWIFT TUNNEL SECTION OF QUABBIN AQUEDUCT

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$49.94	\$29,800.95
Engineering, Headquarters' Office	217.29	\$113,977.89
	<hr/>	<hr/>
Total General Overhead	\$267.23	\$143,778.84

ENGINEERING:

Salaries, Engineering and Clerical	\$1,936.84	\$268,859.08
Consultant Expense	00.00	586.73
Labor	191.50	2,690.80
Furniture and Fixtures	00.00	1,567.40
Engineering Instruments	00.00	4,577.18

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Rent and Upkeep	169.42	10,826.53
Rental of Equipment	00.00	3.00
Automobile Purchase	—297.31	7,713.21
Automobile Maintenance	116.28	18,145.59
Contracts for Investigations and Surveys	00.00	13,525.66
Materials of Construction	00.00	2.25
Miscellaneous Expense (undistributed)	55.76	8,125.58
Printing and Blueprinting	4.44	959.95
Stationery and Office Supplies	15.62	2,206.03
Postage	3.64	529.45
Medical and Surgical Services	13.00	13.00
Total Engineering	\$2,209.19	\$340,331.44
REAL ESTATE:		
Legal and Expert Expense	\$00.00	\$3,103.53
Labor	00.00	12.20
Miscellaneous Expense (undistributed)	00.00	27.16
Printing and Blueprinting	00.00	34.87
Postage	00.00	5.68
Purchases and Settlements	00.00	23,610.00
Taxes	00.00	724.77
Maintenance of Real Estate	00.00	252.79
Fire Protection Equipment	00.00	60.86
Total Real Estate	\$00.00	\$27,831.86
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contract No. 20	\$00.00	\$4,809,852.83
Contract 47, Head House at Shaft 12	19,564.97	19,564.97
Contract No. 53, Head House at Shaft 9	1,666.73	9,785.63
Sub Total Construction Contracts	\$21,231.70	\$4,839,203.43
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	\$132.50	\$445.45
Installed Equipment	17,653.90	24,892.26
Water Supply System	00.00	3,417.56
Miscellaneous Expense	43.71	2,590.91
Sub Total Except Construction Contracts	\$17,830.11	\$31,346.18
Total Permanent Construction	\$39,061.81	\$4,870,549.61
COLDBROOK-SWIFT DAMAGES—EXCEPT AWARDS BY COURT DECREE:		
Purchases and Settlements	\$1,000.00	\$3,800.00
COLDBROOK-SWIFT DAMAGES—AWARDS BY COURT DECREE—JURY VERDICTS:		
Salaries, Engineering and Clerical	\$30.90	\$30.90
Legal Expense	1,511.83	1,553.83
Expert and Other Witness Expense	96.50	96.50
Sub Total Coldbrook-Swift Damages— Awards by Court Decree—Jury Verdicts	\$1,639.23	\$1,681.23
Total Coldbrook-Swift Damages	\$2,639.23	\$5,481.23
TOTAL COLDBROOK-SWIFT TUNNEL	\$44,177.46	\$5,387,972.98

Year ending
Nov. 30, 1938Total to
Nov. 30, 1938

QUABBIN RESERVOIR (PWA ONLY)

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$84.18	\$84.18
Engineering, Headquarters' Office	1,347.60	1,347.60
Total General Overhead	\$1,431.78	\$1,431.78

QUABBIN RESERVOIR CLEARING—PWA ONLY—ENGINEERING:

Salaries, Engineering and Clerical	\$5,261.43	\$5,261.43
Consultant Expense	64.03	64.03
Total Quabbin Reservoir Clearing— PWA Only—Engineering	\$5,325.46	\$5,325.46

QUABBIN HILL ROAD—PWA—ENGINEERING:

Salaries, Engineering and Clerical	\$3,705.81	\$3,705.81
Labor	202.50	202.50
Total Quabbin Hill Road—PWA— Engineering	\$3,908.31	\$3,908.31

REGULATING DAMS—PWA—ENGINEERING:

Salaries, Engineering and Clerical	\$1,114.32	\$1,114.32
Total Regulating Dams—PWA—Engineering	\$1,114.32	\$1,114.32
Total Quabbin Reservoir—PWA Only	\$11,779.87	\$11,779.87

QUABBIN RESERVOIR NOT INCLUDING MAIN DAM AND DIKE (EXCEPT PWA)

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$15,513.52	\$154,006.67
Engineering, Headquarters' Office	48,789.99	668,531.91
Total General Overhead	\$64,303.51	\$822,538.58

ENGINEERING:

Salaries, Engineering and Clerical	\$80,372.12	\$569,952.41
Consultant Expense	891.16	4,252.18
Labor	8,690.81	34,550.59
Legal Expense	4.06	4.06
Compensation to Labor for Injuries	45.77	52.63
Furniture and Fixtures	00.00	3,232.21
Laboratory Equipment	71.96	2,386.49
Laboratory Supplies	306.69	4,496.68
Rental of Equipment	00.00	16.75
Engineering Instruments	163.20	6,475.11
Rent and Upkeep	2,342.43	15,803.08
Medical and Surgical Supplies	11.41	11.41
Medical and Surgical Services	86.50	91.50
Automobile Purchase	1,092.56	23,075.52
Automobile Maintenance	4,913.66	29,081.21
Special Experiments	00.00	422.80
Contracts for Investigations and Surveys	00.00	14,683.87
Office Buildings	00.00	5,059.20
Miscellaneous Expense (undistributed)	2,215.39	10,966.27
Printing and Blueprinting	471.42	3,440.39
Stationery and Office Supplies	617.87	7,944.56
Postage	283.16	1,972.08

Total Engineering (except PWA)	\$102,580.17	\$737,971.00
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Year ending
Nov. 30, 1938Total to
Nov. 30, 1938

REAL ESTATE—EXCEPT AWARDS BY COURT DECREE:

Legal and Expert Expense	\$12,392.78	\$182,843.15
Consultant Expense	00.00	146.78
Labor	2,169.85	19,608.97
Compensation to Labor for Injuries	47.76	113.43
Furniture and Fixtures	00.00	46.06
Medical and Surgical Services	85.00	85.00
Automobile Maintenance	408.43	767.51
Miscellaneous Expense (undistributed)	1,514.97	10,167.32
Advertising	00.00	208.66
Printing and Blueprinting	220.22	1,651.92
Purchases and Settlements	406,857.39	6,941,507.27
Purchase price B. & A. R. R. and N. Y. C. lessee, for part of Athol Branch and gen- eral release of all claims for damages for reservoir construction	00.00	641,240.88*
Taxes	73,286.17	469,646.47
Maintenance of Real Estate	1,363.07	11,301.15
Water Supply System	00.00	48.60
Fire Protection		
Equipment	00.00	5,622.00
Automobile Purchase	00.00	771.69
Automobile Maintenance	53.74	425.26
Labor	1,898.58	7,043.38
Medical and Surgical Services	20.00	20.00
Compensation to Labor for Injuries	00.00	10.00
Miscellaneous Expense	38.79	296.55
Police Protection		
Labor	3,246.05	3,455.05
Special Agents		
Salaries	2,520.00	25,466.00
Equipment	00.00	118.33
Labor	00.00	30.00
Automobile Purchase	381.67	2,240.63
Automobile Maintenance	485.10	4,330.33
Miscellaneous Expense (undistributed)	234.65	1,790.58
Printing and Blueprinting	00.00	52.72
Stationery and Office Supplies	9.44	23.12
Postage	1.50	18.57
Renting Agents		
Salaries	2,880.00	29,408.10
Legal Expense	1,004.32	1,170.57
Furniture and Fixtures	00.00	29.29
Automobile Purchase	381.66	906.61
Automobile Maintenance	271.87	584.51
Labor	00.00	69.50
Miscellaneous Expense (undistributed)	92.20	1,026.06
Printing and Blueprinting	00.00	18.62
Stationery and Office Supplies	8.76	47.04
Postage	68.55	285.69
Payments to Towns	00.00	20,500.00
Sub Total Real Estate—Except Awards by Court Decree	\$511,942.52	\$8,385,143.37

*Includes interest on settlement of \$575,000.00, which settlement was approved and scheduled by Commission on March 29, 1935, and shown in 1935 expenditures although payment was disapproved by Governor and Council and warrant returned to Comptroller's bureau. Rescheduled by Commission with interest on March 4, 1937, in accordance with judgment received from Superior Court, February 15, 1937.

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
REAL ESTATE—AWARDS BY COURT DECREE—BOARD OF REFEREES:		
Salaries of Referees	\$00.00	\$21,140.00
Salaries, Engineering and Clerical	5.78	1,455.16
Legal Expense	3,002.40	14,354.22
Consultant and Engineering Expert Expense	00.00	2,545.50
Expert and Other Witness Expense	14,445.33	22,165.40
Automobile Maintenance	00.00	6.53
Expenses of Board of Referees	00.00	764.30
Miscellaneous Expense	00.00	591.91
Printing and Blueprinting	00.00	21.99
Stationery and Office Supplies	00.00	23.72
Payments Under Certificate of Judgment	00.00	179,041.67
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Sub Total Real Estate—Awards by Court Decree—Board of Referees	\$17,453.51	\$242,110.40

REAL ESTATE—AWARDS BY COURT DECREE—JURY VERDICTS:		
Salaries, Engineering and Clerical	\$00.00	\$27.73
Legal Expense	503.10	1,061.00
Miscellaneous Expense	35.00	37.00
Payments under Certificates of Judgment	13,045.99	20,878.65
Expert and Other Witness Expense	4.80	4.80
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Sub Total Real Estate—Awards by Court Decree—Jury Verdicts	\$13,588.89	\$22,009.18
Total Real Estate	\$542,984.92	\$8,649,262.95

QUABBIN RESERVOIR DAMAGES—EXCEPT AWARDS BY COURT DECREE:		
Salaries, Engineering	\$39.00	\$87.68
Legal and Expert Expense	00.00	931.00
Consultant Expense	00.00	2,158.82
Miscellaneous Expense (undistributed)	00.00	15.19
Printing and Blueprinting	00.00	2.96
Purchases and Settlements	340.00	48,681.00
<hr/>		
Sub Total Quabbin Reservoir Damages— Except Awards by Court Decree	\$379.00	\$51,876.65

QUABBIN RESERVOIR DAMAGES—AWARDS BY COURT DECREE— BOARD OF REFEREES:		
Legal Expense	\$200.89	\$200.89
Expert and Other Witness Expense	40.00	40.00
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Sub Total Quabbin Reservoir Damages— Awards by Court Decree—Board of Referees	\$240.89	\$240.89
Total Quabbin Reservoir Damages	\$619.89	\$52,117.54

SWIFT DIVERSION DAMAGES (INCLUDING BEAVER BROOK) EXCEPT AWARDS BY COURT DECREE:		
Salaries, Engineering and Clerical	\$6,244.28	\$92,384.29
Legal and Expert Expense	00.00	5,814.80
Consultant Expense	316.02	71,200.91
Labor	551.37	2,086.47
Medical and Surgical Supplies	2.20	2.20
Furniture and Fixtures	00.00	78.18
Laboratory Equipment	64.78	2,199.90
Laboratory Supplies	275.98	3,938.46

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Engineering Instruments	00.00	762.98
Rent and Upkeep	416.39	829.42
Rental of Equipment	00.00	10.50
Automobile Purchase	4.50	1,538.22
Automobile Maintenance	261.46	4,495.82
Contracts for Investigations and Surveys	00.00	569.47
Materials of Construction	00.00	18.99
Miscellaneous Expense (undistributed)	58.49	6,248.31
Printing and Blueprinting	18.03	1,085.48
Stationery and Office Supplies	00.00	85.68
Purchases and Settlements	00.00	1,225,650.00
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Sub Total Swift Diversion Damages— Except Awards by Court Decree	\$8,213.50	\$1,419,000.08

BEAVER BROOK DIVERSION DAMAGES—AWARDS BY COURT

DECREE—JURY VERDICTS:

Salaries, Engineering and Clerical	\$00.00	\$488.90
Legal Expense	00.00	3,303.27
Consultant and Engineering Expert Expense	00.00	2,815.05
Expert and Other Witness Expense	00.00	6,350.00
Automobile Maintenance	00.00	104.94
Miscellaneous Expense (undistributed)	00.00	328.48
Printing and Blueprinting	00.00	22.18
Stationery and Office Supplies	00.00	19.55
Postage	00.00	1.00
Payments under Certificates of Judgment	00.00	9,985.53
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Sub Total Beaver Brook Diversion Damages—

Awards by Court Decree—Jury Verdicts \$00.00 \$23,418.90

Total Swift Diversion Damages (including Beaver Brook) \$8,213.50 \$1,442,418.98

QUABBIN RESERVOIR—LIQUIDATION OF TOWNS, TOWN OBLIGATIONS:

Town Obligations:

Town of Enfield	\$6,322.43	\$6,322.43
Town of Greenwich	3,624.00	3,624.00
Town of Prescott	1,730.29	1,730.29
Town of Dana	7,502.25	7,502.25
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Sub Total, Town Obligations \$19,178.97 \$19,178.97

QUABBIN RESERVOIR—LIQUIDATION OF TOWNS, LIQUIDATING EXPENSES:

Liquidating Expenses:

Salaries, Engineering	\$501.75	\$501.75
Legal and Expert Expense	732.66	732.66
Labor	904.49	904.49
Miscellaneous Expense	55.50	55.50
Automobile Maintenance	49.42	49.42
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Sub Total, Liquidating Expenses \$2,243.82 \$2,243.82

Total, Quabbin Reservoir, Liquidation of Towns \$21,422.79 \$21,422.79

QUABBIN RESERVOIR—CEMETERIES—QUABBIN PARK

CEMETERY CONSTRUCTION:

Salaries, Engineering and Clerical	\$1,422.40	\$13,774.67
Legal and Expert Expense	455.00	520.00
Consultant Expense	149.55	274.55

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Labor	10,402.30	34,879.20
Tools and Equipment	30.42	502.69
Automobile Purchase	500.00	4,192.88
Automobile Maintenance	714.48	3,000.91
Rental of Equipment	00.00	33.19
Purchases and Settlements	00.00	8,850.00
Construction Materials	765.06	2,984.83
Purchase and Planting of Trees and Shrubbery	00.00	218.93
Receiving Vault	00.00	2,768.85
Water Supply System	00.00	1,251.97
Maintenance of Grounds	6,185.22	15,770.31
Miscellaneous Expense (undistributed)	491.07	1,675.15
Printing and Blueprinting	4.60	188.30
Stationery and Office Supplies	00.00	27.20
Medical and Surgical Services	8.00	8.00
Completed Contract No. 34	00.00	7,842.94
Compensation for Labor for Injuries	31.84	69.27
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Sub Total Quabbin Park Cemetery Construction	\$21,159.94	\$98,833.84

REMOVALS FROM CEMETERIES WITHIN RESERVOIR

AREA TO QUABBIN PARK CEMETERY:

Salaries, Engineering and Clerical	\$4,565.85	\$16,676.44
Tools and Equipment	180.34	684.63
Automobile Purchase	00.00	2,669.99
Automobile Maintenance	558.15	2,428.85
Removal and Reinterment of Bodies	6,261.14	26,482.20
Removal and Resetting of Monuments	3,409.33	16,017.60
Miscellaneous Expense	00.00	6.75
Rental of Equipment	00.00	10.50
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Sub Total Removals to Quabbin Park Cemetery	\$14,974.81	\$64,976.96

REMOVALS FROM CEMETERIES WITHIN RESERVOIR

AREA TO CEMETERIES OTHER THAN QUABBIN PARK:

Salaries, Engineering and Clerical	\$221.74	\$6,572.23
Tools and Equipment	00.00	15.43
Automobile Purchase	00.00	380.00
Automobile Maintenance	00.00	155.73
Purchases and Settlements	140.00	7,841.60
Perpetual Care Fund Contributions	00.00	175.00
Removal and Reinterment of Bodies	139.98	7,513.27
Removal and Resetting of Monuments	84.53	6,404.41
Miscellaneous Expense	00.00	123.51
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Sub Total Removals to Other Cemeteries	\$586.25	\$29,181.18
Total Quabbin Reservoir Cemeteries	\$36,721.00	\$192,991.98

PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:

Contract No. 47, Construction of Service Building and Head House at Shaft 12	-\$15,496.33	\$15,679.76
Completed Contract No. 49, Excavation of Diversion Channels	00.00	84,789.69
Completed Contract No. 51, Construction of East Branch Baffle	00.00	189,545.99

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Contract No. 56, Construction of Administration Buildings at Main Dam	272,360.64	356,445.95
Completed Contract No. 59, Drilling a Well for Water Supply at Administration Buildings	00.00	691.28
Contract No. 60, Access Road to Shaft No. 12	58,485.85	58,485.85
Sub Total Construction Contracts	\$315,350.16	\$705,638.52
PERMANENT CONSTRUCTION—AWARDS BY COURT DECREE—		
ACTIONS FOR BREACH OF CONTRACT:		
Salaries, Engineering	\$00.00	\$3,206.50
Legal Expense	1,686.06	3,831.51
Miscellaneous Expense	00.00	314.98
Consultant and Engineering Expert Expense	5,757.65	5,757.65
Sub Total Awards by Court Decree—		
Actions for Breach of Contract	\$7,443.71	\$13,110.64
OTHER PERMANENT CONSTRUCTION—EXCEPT CLEARING:		
Installed Equipment	\$2,314.68	\$3,817.39
Furniture and Fixtures	34.90	34.90
Labor	575.01	2,257.51
Compensation to Labor for Injuries	71.64	279.74
Medical and Surgical Services	54.50	54.50
Automobile Maintenance	2.25	2.25
Materials of Construction	293.00	293.00
Miscellaneous Expense (undistributed)	729.80	1,407.18
Printing and Blueprinting	2.50	26.78
Sub Total Other Construction—Except Clearing	\$4,078.28	\$8,173.25
OTHER PERMANENT CONSTRUCTION—1936 CLEARING PROJECT:		
Tools and Equipment	\$7.36	\$22,772.12
Labor	00.00	1,721,299.70
Compensation to Labor for Injuries	7,866.03	37,652.96
Miscellaneous Expense (undistributed)	6.00	2,749.65
Printing and Blueprinting	00.00	69.76
Stationery and Office Supplies	00.00	1,029.84
Postage	00.00	186.71
Automobile Purchase	—297.31	11,734.22
Automobile Maintenance	00.00	5,404.67
Furniture and Fixtures	00.00	877.65
Rent and Upkeep	00.00	826.98
Medical and Surgical Equipment	126.90	299.72
Medical and Surgical Supplies	00.00	2,023.67
Medical and Surgical Services	515.00	14,073.13
Fire Protection		
Equipment	00.00	425.87
Miscellaneous Expense	00.00	132.72
Labor	00.00	4,175.00
Legal Expense	1,384.40	5,669.83
Sub Total 1936 Clearing Project	\$9,608.38	\$1,831,404.19
OTHER PERMANENT CONSTRUCTION—RESERVOIR CLEARING		
(EXCEPT PWA) NOT INCLUDING 1936 CLEARING PROJECT:		
Labor	\$14,875.27	\$38,724.07
Miscellaneous Expense (undistributed)	218.08	218.08

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Printing and Blueprinting	39.11	39.11
Stationery and Office Supplies	111.45	111.45
Advertising	261.41	261.41
Medical and Surgical Services	146.00	146.00
Tools and Equipment	144.73	144.73
Automobile Purchase	776.44	776.44
Automobile Maintenance	93.47	93.47

Sub Total Reservoir Clearing (Except PWA)

Not Including 1936 Clearing Project	\$16,665.96	\$40,514.76
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Total Quabbin Reservoir Permanent

Construction	\$353,146.49	\$2,598,841.36
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HIGHWAY AND PUBLIC UTILITY RELOCATION :

Salaries, Engineering and Clerical	\$6,945.98	\$218,700.27
Legal and Expert Expense	00.00	49.10
Consultant Expense	00.00	9,117.56
Labor	1,229.36	12,691.52
Furniture and Fixtures	00.00	61.74
Completed Contracts Nos. 21, 40, 41, 43, 44, 54 and 55	00.00	1,010,622.27
Contract 57, Construction of a Portion of the Petersham-New Salem Highway in the County of Franklin	13,362.86	95,771.90
Installed Equipment	00.00	811.57
Temporary Equipment	00.00	149.50
Engineering Instruments	00.00	948.75
Automobile Purchase	00.00	535.00
Automobile Maintenance	113.55	6,123.34
Miscellaneous Expense (undistributed)	0.24	8,651.54
Printing and Blueprinting	3.60	690.48
Stationery and Office Supplies	00.00	159.13
Maintenance of Real Estate	00.00	551.60

Total Highway and Public Utility

Relocation	\$21,655.59	\$1,365,635.27
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QUABBIN RESERVOIR WATERSHED PROTECTION—
REFORESTATION, NURSERIES :

Nurseries :

Salaries, Engineering	\$1,525.24	\$3,323.39
Labor	11,335.97	30,549.59
Tools and Equipment	231.03	3,846.24
Automobile Purchase	—224.00	174.50
Automobile Maintenance	563.48	1,141.84
Nursery Stock	00.00	2,622.85
Nursery Supplies	908.32	2,758.44
Miscellaneous Expense	3.03	142.81
Medical and Surgical Services	31.00	31.00
Compensation to Labor for Injuries	27.86	27.86

Subtotal Reforestation, Nurseries	\$14,401.93	\$44,618.52
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QUABBIN RESERVOIR WATERSHED PROTECTION—
REFORESTATION, WATERSHED PLANTING :

Watershed Planting :

Salaries, Engineering	\$381.25	\$1,284.51
Labor	4,737.25	17,253.35

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Tools and Equipment	78.00	262.81
Automobile Maintenance	27.52	193.69
Trees for Watershed Planting	00.00	1,713.00
Nursery Supplies	00.00	1,402.86
Miscellaneous Expense	00.00	63.85
Medical and Surgical Services	139.00	139.00
Compensation to Labor for Injuries	111.44	111.44
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Sub Total Reforestation, Watershed Planting	\$5,474.46	\$22,424.51

QUABBIN RESERVOIR WATERSHED PROTECTION—

REFORESTATION, FIRE STOPS AND FIRE ACCESS ROADS:

Salaries, Engineering	\$1,400.75	\$1,400.75
Legal and Expert Expense	81.24	81.24
Labor	22,344.01	22,344.01
Compensation to Labor for Injuries	807.94	807.94
Medical and Surgical Services	367.00	367.00
Contract No. 60, Access Road, Shaft 12	4,993.96	4,993.96
Automobile Purchase	500.00	500.00
Automobile Maintenance	610.00	610.00
Miscellaneous Expense (undistributed)	525.18	525.18
Printing and Blueprinting	12.21	12.21
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Sub Total Reforestation, Fire Stops and Fire Access Roads	\$31,642.29	\$31,642.29

QUABBIN RESERVOIR WATERSHED PROTECTION—

FENCING OF WATERSHED PROPERTY:

Labor	\$1,737.66	\$1,737.66
Automobile Maintenance	74.82	74.82
Miscellaneous Expense	120.43	120.43
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Sub Total, Fencing of Watershed Property	\$1,932.91	\$1,932.91
Total, Quabbin Reservoir Watershed Protection	\$53,451.59	\$100,618.23
Total, Quabbin Reservoir, not including Main Dam and Dike (except PWA)	\$1,205,099.45	\$15,983,818.68
TOTAL QUABBIN RESERVOIR, EXCEPT Main DAM AND DIKE	\$1,216,879.32	\$15,995,598.55

MAIN DAM

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$7,099.00	\$46,606.48
Engineering, Headquarters' Office	23,415.11	163,946.66
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Total General Overhead	\$30,514.11	\$210,553.14

ENGINEERING:

Salaries, Engineering and Clerical	\$57,503.55	\$279,372.49
Legal and Expert Expense	31.14	35.20
Consultant Expense	122.17	5,840.71
Labor	16,070.15	42,299.64
Furniture and Fixtures	9.51	228.60
Laboratory Equipment	58.48	722.99
Rental of Equipment	00.00	1,202.25
Engineering Instruments	45.97	782.35

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Rent and Upkeep	200.57	1,516.01
Automobile Purchase	525.00	2,958.00
Automobile Maintenance	1,783.05	7,440.36
Contracts for Investigations and Surveys	00.00	61,895.52
Office Buildings	00.00	578.39
Special Experiments	00.00	1,853.29
Water Supply System	00.00	20.00
Compensation to Labor for Injuries	43.78	43.78
Medical and Surgical Services	64.50	68.50
Miscellaneous Expense (undistributed)	428.39	12,961.63
Printing and Blueprinting	284.19	2,078.49
Stationery and Office Supplies	152.41	1,429.27
Postage	37.75	171.33
Laboratory Supplies	32.45	228.09
Total Engineering	\$77,393.06	\$423,726.00
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts Nos. 30, 32, 36 and 38	\$00.00	\$2,411,543.40
Contract No. 52, Constructing Embankment at Main Dam	\$638,897.90	\$1,461,489.80
Sub Total Construction Contracts	\$638,897.90	\$3,873,033.20
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	\$1,541.00	\$6,125.25
Installed Equipment	16,685.42	20,277.47
Temporary Equipment	00.00	4,213.39
Miscellaneous Expense	82.15	12,701.70
Tools and Equipment	133.30	133.30
Sub Total Except Construction Contracts	\$18,441.87	\$43,451.11
Total Permanent Construction	\$657,339.77	\$3,916,484.31
TOTAL MAIN DAM	\$765,246.94	\$4,550,764.34
QUABBIN RESERVOIR BEAVER BROOK DIKE		
GENERAL OVERHEAD:		
Administration, Commissioners' Office	\$468.12	\$28,584.61
Engineering, Headquarters' Office	1,525.96	106,571.66
Total General Overhead	\$1,994.08	\$135,156.27
ENGINEERING:		
Salaries, Engineering and Clerical	\$11,500.44	\$175,082.63
Consultant Expense	157.67	5,662.78
Labor	4,009.61	33,828.25
Furniture and Fixtures	2.82	149.77
Laboratory Equipment	58.51	584.95
Rental and Equipment	00.00	921.50
Engineering Instruments	00.00	155.65
Rent and Upkeep	45.65	73.68
Automobile Purchase	00.00	600.00
Medical and Surgical Services	7.50	7.50
Automobile Maintenance	551.67	3,507.78
Contracts for Investigations and Surveys	00.00	24,773.32
Special Experiments	00.00	305.20
Miscellaneous Expense (undistributed)	147.94	5,046.94

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Printing and Blueprinting	13.17	1,348.63
Stationery and Office Supplies	20.91	206.91
Advertising	00.00	79.34
Postage	00.00	00.30
Laboratory Supplies	32.43	245.72
Maintenance of Grounds	81.47	81.47
Total Engineering	\$16,629.79	\$252,662.32
PERMANENT CONSTRUCTION—CONSTRUCTION CONTRACTS:		
Completed Contracts Nos. 32 and 36	\$00.00	\$1,054,137.90
Contract No. 50, Constructing the Embankment of the Dike	\$41,049.81	\$1,401,751.98
Sub Total Construction Contracts	\$41,049.81	\$2,455,889.88
PERMANENT CONSTRUCTION—EXCEPT CONSTRUCTION CONTRACTS:		
Labor	\$4,133.43	\$15,142.48
Temporary Equipment	00.00	1,993.18
Tools and Equipment	133.30	148.00
Installed Equipment	00.00	235.00
Miscellaneous Expense	119.00	1,804.76
Sub Total Except Construction Contracts	\$4,385.73	\$19,323.42
Total Permanent Construction	\$45,435.54	\$2,475,213.30
TOTAL QUABBIN RESERVOIR BEAVER BROOK DIKE	\$64,059.41	\$2,863,031.89
SPECIAL INVESTIGATIONS		
RELATIVE TO POLLUTION OF WARE AND QUINAPOXET WATERSHEDS:		
(Expenditures under Chapter 66, Resolves of 1931)	\$00.00	\$1,995.99
RELATIVE TO SETTING OFF A PORTION OF LAKE COCHITUATE FOR BOATING AND FISHING:		
(Expenditures under Chapter 18, Resolves of 1936)	\$00.00	\$12,512.58
RELATIVE TO IMPROVING DISTRIBUTION SYSTEM AND PREVENTING POLLUTION OF SOURCE OF SUPPLY OF METROPOLITAN WATER DISTRICT:		
(Expenditures under Chapter 48, Resolves of 1936)		
GENERAL OVERHEAD:		
Administration, Commissioners' Office	\$355.91	\$2,789.67
Engineering, Headquarters' Office	1,926.17	15,805.54
Total General Overhead	\$2,282.08	\$18,595.21
ENGINEERING:		
Salaries, Engineering and Clerical	\$9,231.79	\$50,867.24
Consultant Expense	983.40	983.40
Furniture and Fixtures	00.00	221.98
Engineering Instruments	00.00	1,120.12
Atlases	00.00	2,097.00
Automobile Purchase	00.00	1,492.50
Automobile Maintenance	399.87	2,154.33

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Contracts for Investigations and Surveys	6,150.65	54,123.95
Miscellaneous Expense (undistributed)	208.18	2,370.30
Printing and Blueprinting	544.06	775.20
Stationery and Office Supplies	25.23	226.37
Laboratory Supplies	00.00	23.46
Purchases and Settlements	50.00	50.00
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Total Engineering	\$17,593.18	\$116,505.85
Total—Chapter 48 Investigation	\$19,875.26	\$135,101.06
TOTAL SPECIAL INVESTIGATIONS	\$19,875.26	\$149,609.63

SOUTHERN SUDBURY EMERGENCY SUPPLY

Total Expenditure	\$00.00	\$638,533.83
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WACHUSETT WATERSHED—ELIMINATION OF POLLUTION

ENGINEERING:

Salaries, Engineering and Clerical	\$591.50	\$591.50
Printing and Blueprinting	5.25	5.25
Stationery and Office Supplies	1.27	1.27
Rent and Upkeep	7.52	7.52
Automobile Maintenance	18.75	18.75
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TOTAL WACHUSETT WATERSHED ELIMINATION OF POLLUTION	\$624.29	\$624.29

WESTON AQUEDUCT SIPHONS (PWA)

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$4.54	\$4.54
Engineering, Headquarters' Office	2,585.39	2,585.39
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Total General Overhead	\$2,589.93	\$2,589.93

ENGINEERING:

Salaries, Engineering and Clerical	\$905.82	\$905.82
Consultant Expense	63.76	63.76
Furniture and Fixtures	45.00	45.00
Engineering Instruments	45.76	45.76
Miscellaneous Expense (undistributed)	87.08	87.08
Printing and Blueprinting	118.21	118.21
Stationery and Office Supplies	101.12	101.12
Advertising	207.75	207.75
Rent and Upkeep	18.56	18.56
Automobile Maintenance	4.70	4.70
<hr/>		
Total Engineering	\$1,597.76	\$1,597.76
TOTAL WESTON AQUEDUCT SIPHONS	\$4,187.69	\$4,187.69

NEW PRESSURE AQUEDUCT AND HIGH LEVEL DISTRIBUTING RESERVOIR (PWA)
SECTION WEST OF HIGH LEVEL DISTRIBUTING
RESERVOIR IN WESTON (PWA)

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$23.26	\$23.26
Engineering, Headquarters' Office	10,708.87	10,708.87
<hr/>		
Total General Overhead	\$10,732.13	\$10,732.13

Year ending
Nov. 30, 1938Total to
Nov. 30, 1938

ENGINEERING:

Salaries, Engineering and Clerical	\$14,937.84	\$14,937.84
Consultant Expense	512.61	512.61
Tools and Equipment	178.32	178.32
Furniture and Fixtures	344.40	344.40
Engineering Instruments	4,133.76	4,133.76
Purchase of Automobiles	8,735.37	8,735.37
Labor	578.62	578.62
Miscellaneous Expense (undistributed)	2,317.06	2,317.06
Printing and Blueprinting	100.07	100.07
Stationery and Office Supplies	236.78	236.78
Advertising	14.28	14.28
Postage	21.00	21.00
Medical and Surgical Supplies	2.94	2.94
Rent and Upkeep	314.35	314.35
Automobile Maintenance	474.59	474.59
Contracts for Investigations and Surveys	390.00	390.00
 Total Engineering	 \$33,291.99	 \$33,291.99

REAL ESTATE:

Salaries, Engineering and Clerical	\$1,673.29	\$1,673.29
Fire Protection, Equipment	34.69	34.69
 Total Real Estate	 \$1,707.98	 \$1,707.98
Total, Section West of High Level Distributing Reservoir in Weston	\$45,732.10	\$45,732.10

HIGH LEVEL DISTRIBUTING RESERVOIR IN WESTON (PWA)

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$00.00	\$00.00
Engineering, Headquarters' Office	70.97	70.97
 Total, High Level Distributing Reservoir in Weston	 \$70.97	 \$70.97

SECTION EAST OF HIGH LEVEL DISTRIBUTING RESERVOIR
IN WESTON (PWA)

GENERAL OVERHEAD:

Administration, Commissioners' Office	\$00.00	\$00.00
Engineering, Headquarters' Office	428.37	428.37
 Total General Overhead	 \$428.37	 \$428.37

ENGINEERING:

Salaries, Engineering and Clerical	\$436.55	\$436.55
Consultant Expense	47.15	47.15
Miscellaneous Expense (undistributed)	14.03	14.03
Printing and Blueprinting	1.05	1.05
Advertising	13.56	13.56
 Total Engineering	 \$512.34	 \$512.34

REAL ESTATE:

Salaries, Engineering and Clerical	\$34.16	\$34.16
 Total Real Estate	 \$34.16	 \$34.16

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
Total, Section East of High Level		
Reservoir in Weston	\$974.87	\$974.87
TOTAL NEW PRESSURE AQUEDUCT AND HIGH LEVEL DISTRIBUTING RESERVOIR (PWA)	\$46,777.94	\$46,777.94

SUPERSTRUCTURE AT SHAFT No. 4—SOUTHBOROUGH TUNNEL:

ENGINEERING:

Salaries, Engineering and Clerical	\$101.89	\$101.89
TOTAL SUPERSTRUCTURE AT SHAFT No. 4— SOUTHBOROUGH TUNNEL	\$101.89.	\$101.89

SUMMARY

CONSTRUCTION FUND

Total authorized under Chapters 111 and 375, Acts of 1926, and Chapter 321, Acts of 1927	\$65,900,000.00	
Amount reverted from authori- zation under said Chapter 111	261,466.17	\$65,638,533.83

Received from City of Worces- ter under said Chapter 321	\$1,000,000.00
Serial Bonds is- sued and matured	8,397,000.00
Serial Bonds out- standing Nov. 30, 1938	38,853,000.00
Balance of Au- thorization	17,388,533.83
	<u>\$65,638,533.83</u>

Total Construction Fund (in Addition to Receipts Credited) . \$65,638,533.83

EXPENDITURES

SOUTHERN SUDBURY EMERGENCY SUPPLY	\$00.00	\$638,533.83
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WARE AND SWIFT SUPPLY

Wachusett-Coldbrook Tunnel, Ware Supply	\$102,567.00	\$14,167,111.03
Wachusett Watershed Protection	12,084.93	18,823.22
Coldbrook-Swift Tunnel	44,177.46	5,387,972.98
Quabbin Reservoir Except Main Dam and Dike	1,216,879.32	15,995,598.55
Main Dam	765,246.94	4,550,764.34
Quabbin Reservoir Beaver Brook Dike	64,059.41	2,863,031.89

SPECIAL INVESTIGATIONS	19,875.26	149,609.63
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PRESSURE AQUEDUCT, ETC.

Wachusett Watershed, Elimination of Pollution	624.29	624.29
Weston Aqueduct Siphons, PWA	4,187.69	4,187.69

	Year ending Nov. 30, 1938	Total to Nov. 30, 1938
New Pressure Aqueduct and High Level Distributing Reservoir in Weston, PWA Superstructure Shaft No. 4, Southborough Tunnel	46,777.94 101.89	46,777.94 101.89
Total Expenditures	\$2,276,582.13	\$43,823,137.28

RECEIPTS

Receipts from Sales	\$47,438.47	\$398,862.80
Receipts from Rents	15,886.96	452,924.40
All other Receipts	10,750.68	117,022.96
Total Receipts	\$74,076.11	\$968,810.16

DISTRIBUTION OF RECEIPTS

Credited as follows:

To Assessments			
Rents and Sales, to 1928			
Assessment	\$3,033.03		
Rents and Sales, to 1929			
Assessment	24,343.77		
Interest, to 1928-1934			
Assessments	282.11	\$00.00	\$27,658.91
To Construction Fund	74,076.11		941,151.25
	\$74,076.11		\$968,810.16

Financial Statement Verified.
Approved.

GEO. E. MURPHY,
Comptroller.

A tabulation of the acts and resolves under the authority of which expenditures are made by the Metropolitan District Water Supply Commission was included in the 1937 Annual Report.

Subsequent acts and resolves are as follows:

<i>Chapter</i>	<i>Brief Description</i>
240, Acts of 1938	Provisions for annexing Dana, Enfield, Greenwich and Prescott to contiguous towns.
460, Acts of 1938	Works to eliminate pollution. Completion of Weston Aqueduct Siphons. Portions of Pressure Aqueduct, etc.
501, Acts of 1938	Pressure Aqueduct to Chestnut Hill. Federal grant on works to eliminate pollution, on aqueducts and other distribution works and on portion of works to complete Ware-Swift project.

COMMONWEALTH OF MASSACHUSETTS

METR. DISTR. WATER SUPPLY COMMISSION

LOCATION OF REAL ESTATE ACQUIRED FOR THE QUABBIN RESERVOIR

(TITLE VESTED IN COMMONWEALTH)

TOWNS	TOTAL NOV. 30, 1937 AS PREVIOUSLY REPORTED (ACRES)	TOTAL NOV. 30, 1938. (ACRES)	REMARKS.
BARRE.	22	22	*DANA, ENFIELD, GREENWICH AND PRESCOTT WERE DISCONTINUED, AND DIVIDED AMONG THE CONTIGUOUS TOWNS TO WHICH THEY WERE ANNEXED ON APRIL 28, 1938.
BELCHERTOWN, within former limits. IN FORMER TOWN OF ENFIELD.	3,063	3,091	
DANA.*		1,699	
ENFIELD.*	9,611		
GREENWICH.*	8,826		
HARDWICK, within former limits.	11,185		
IN FORMER TOWN OF GREENWICH.	3,577	4,496	
NEW SALEM, within former limits.		607	
IN FORMER TOWN OF ENFIELD.	10,839	11,727	
IN FORMER TOWN OF GREENWICH.		3,500	
IN FORMER TOWN OF PRESCOTT.		2,934	
ORANGE.		11,522	
PELHAM, within former limits.	19	29,683	
IN FORMER TOWN OF ENFIELD.	4,961	52	
PETERSHAM, within former limits.		6,911	
IN FORMER TOWN OF DANA.	1,712		
IN FORMER TOWN OF GREENWICH.		20,675	
IN FORMER TOWN OF PRESCOTT.			
PRESCOTT.*	10,659		
SHUTESBURY.	4,063	4,492	
WARE, within former limits.	877		
IN FORMER TOWN OF ENFIELD.		949	
IN FORMER TOWN OF GREENWICH.		4,600	
WENDELL.	377	2,481	
TOTALS.	62,791.	80,135	

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

STATUS OF CONTRACTS COMPLETED BETWEEN NOV. 30, 1937 AND NOV. 30, 1938

CONT. NO.	DESCRIPTION	LOCATION	SUPPLY	CONTRACTOR	BIDS OPENED	NO. OF BIDS	CONTRACT AWARDED	BASIS OF AWARD	FINAL ESTIMATE	DATE OF FINAL EST.
47	Service Building & Head House at Shaft 12 of Quabbin Reservoir.	Greenwich**	Swift	Vincent Cairn	Apr. 17, 1936	4	April 21, 1936	\$ 34,990.00	\$*35,744.73	Jan. 4, 1938.
50	Dike Embankment-Quabbin Reservoir.	Enfield & Ware	Swift	The Arthur A. Johnson Corporation	Nov. 13, 1934	6	Nov. 26, 1934	1,446,655.00	\$1,402,751.98	Nov. 9, 1938.
53	Head House at Shaft #9 Quabbin Aqueduct	Barre	Swift	The English Construction Co.	Apr. 24, 1936	2	Apr. 30, 1936	9,300.00	9,785.63	June 9, 1938.
57	Portion of Petersham-New Salem Highway	New Salem	Swift	John LaFolla Constr. Co.	July 2, 1936	6	July 2, 1936	161,109.50	▲ 168,822.96	Nov. 24, 1937.
58	Making Core Borings (A contract by the Joint Board under Chapter 48, Resolves of 1936, i.e., House Bill 262, 1936)	Counties of Middlesex, Norfolk, Suffolk and Worcester.	Special Investigation	Pennsylvania Drilling Company	Mar. 18, 1937	6	Mar. 23, 1937	52,950.00	50,944.65	Dec. 18, 1937.

* \$500.00 of this total withheld pending expiration of guarantee period.

† 1,000.00 of this total withheld as a guarantee of removal of Contractor's equipment.

▲ Of this amount the State Dept. of Public Works has paid \$73,051.06 covering the surfacing, and guard rail items.

** Annexed to adjoining towns since contract was awarded.

(The above contracts were all awarded to the lowest bidder.)

CANVASS OF BIDS FOR CONTRACT 66 OPENED AUGUST 25, 1938.

Item	Description	Quantity	Unit	* ①		②		③		④		⑤		⑥		⑦		⑧		⑨		⑩		⑪	
				Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount	Price	Amount
				C & R. Construction Co. 75 Bradeen Street Roslindale, Mass.		National Engineering & Contracting Co. 66 Park St. Dorchester, Mass.		Frank T. Westcott 95 High Street North Attleboro, Mass.		M. DeMatteo Construction Co. 55 Stella Road Roslindale, Mass.		Carlo Bianchi & Company, Inc. 24 Union Ave., Framingham, Mass.		B.A. Gardetto, Inc. 79 Milk St. Boston, Mass.		Kuchar Bros. Montvale, N. J.		J.F. Fitzgerald Constr. Co. 214 Essex St. Boston, Mass.		V. Barletta Co. 10 Whipple Avenue Roslindale, Massachusetts		The Two Companies, Inc. Boston, Mass.		Benjamin Foster Co. 20th & Erie Ave. Phila., Pa.	
1	Clearing	725	Acre	90.	65,250.	50.	36,250.	100.	72,500.	85.	61,625.	125.	90,625.	150.	108,750.	110.	79,750.	147.50	106,937.50	95.	68,875.	170.	123,250.	150.	108,750.
2	Grubbing	30	Acre	90.	2,700.	300.	9,000.	160.	4,800.	100.	3,000.	150.	4,500.	240.	7,200.	300.	9,000.	225.	6,750.	400.	12,000.	300.	9,000.	200.	6,000.
3	Earth Excavation	40,000	Cu.Yd.	0.40	16,000.	.44	17,600.	.40	16,000.	.32	12,800.	.25	10,000.	.30	12,000.	.50	20,000.	.33	13,200.	.60	24,000.	.45	18,000.	.50	20,000.
4	Rock Excavation	1,000	Cu.Yd.	2.	2,000.	3.	3,000.	2.	2,000.	3.25	3,250.	2.	2,000.	.30	300.	7.	7,000.	3.	3,000.	4.	4,000.	4.	4,000.	1.50	1,500.
5	Consolidated Pervious Embankment	20,000	Cu.Yd.	.25	5,000.	.50	10,000.	.20	4,000.	.48	9,600.	.25	5,000.	.17	3,400.	.30	6,000.	.44	8,800.	.40	8,000.	.45	9,000.	.45	9,000.
6	Rolled Impervious Embankment	7,500	Cu.Yd.	1.	7,500.	.50	3,750.	1.	7,500.	1.05	7,875.	.75	5,625.	.50	3,750.	.80	6,000.	.44	3,300.	.90	6,750.	.75	5,625.	.60	4,500.
7	Miscellaneous Embankment	3,000	Cu.Yd.	.30	900.	.44	1,320.	.20	600.	.04	1,200.	.25	750.	.45	1,350.	.20	600.	.44	1,320.	.60	1,800.	.45	1,350.	.60	1,800.
8	Selected Coarse Material	3,500	Cu.Yd.	.60	2,100.	.50	1,750.	.50	1,750.	.60	2,100.	.25	875.	.50	1,750.	1.	3,500.	.45	1,575.	1.	3,500.	.45	1,575.	.60	2,100.
9	Crushed Stone or Screened Gravel	2,700	Cu.Yd.	2.50	6,750.	3.25	8,775.	1.50	4,050.	2.05	5,535.	1.50	4,050.	1.50	4,050.	2.	5,400.	2.40	6,480.	3.50	9,450.	1.50	4,050.	4.50	12,150.
10	Riprap	5,000	Cu.Yd.	1.50	7,500.	3.25	16,250.	1.50	7,500.	2.60	13,000.	2.50	12,500.	2.50	12,500.	3.	15,000.	2.00	10,000.	3.50	17,500.	3.	15,000.	2.75	13,750.
11	Paving	500	Cu.Yd.	5.	2,500.	10.	5,000.	5.	2,500.	4.50	2,250.	3.	1,500.	4.	2,000.	10.	5,000.	3.50	1,750.	5.00	2,500.	6.	3,000.	5.	2,500.
12	Soil Dressing	800	Cu.Yd.	1.	800.	1.	800.	1.50	1,200.	1.50	1,200.	1.	800.	1.	800.	2.	1,600.	1.10	880.	1.50	1,200.	1.50	1,200.	1.	800.
13	Seeding and Grassing	1	Acre	300.	300.	200.	200.	200.	200.	600.	600.	250.	250.	250.	250.	300.	300.	75.	75.	400.	400.	200.	200.	200.	200.
14	Gravel Road Surfacing	5,000	Cu.Yd.	.40	2,000.	.60	3,000.	.65	3,250.	.85	4,250.	.35	1,750.	.40	2,000.	.90	4,500.	.45	2,250.	1.20	6,000.	1.	5,000.	.50	2,500.
15	Portland Cement	5,000	Bbl.	2.70	13,500.	2.60	13,000.	3	15,000.	3.16	15,800.	2.75	13,750.	3.	15,000.	3.	15,000.	2.65	13,250.	3.	15,000.	3.	15,000.	3.70	18,500.
16	Concrete, Class A	1,100	Cu.Yd.	7.50	8,250.	10.	11,000.	10.	11,000.	8.00	8,800.	13.	14,300.	9.	9,900.	10.	11,000.	8.20	9,020.	8.	8,800.	18.	19,800.	15.	16,500.
17	Concrete, Class B	1,100	Cu.Yd.	8.	8,800.	15.	16,500.	15.	16,500.	9.75	10,725.	13.	14,300.	11.	12,100.	13.	14,300.	16.20	17,820.	11.	12,100.	18.	19,800.	20.	22,000.
18	Concrete, Class C	800	Cu.Yd.	12.50	10,000.	21.	16,800.	18.	14,400.	16.50	13,200.	14.	11,200.	23.	18,400.	16.	12,800.	14.96	11,968.	15.	12,000.	18.	14,400.	22.	17,600.
19	Reinforcing Steel	70,000	Lb.	.035	2,450.	.06	4,200.	.05	3,500.	.057	3,990.	.05	3,500.	.05	3,500.	.06	4,200.	.06	4,200.	.05	3,500.	.06	4,200.	.06	4,200.
20	Miscellaneous Steel and Iron	50,000	Lb.	.07	3,500.	.07	3,500.	.08	4,000.	.19	9,500.	.10	5,000.	.10	5,000.	.14	7,000.	.09	4,500.	.09	4,500.	.15	7,500.	.12	6,000.
21	Galvanizing	15,000	Lb.	.05	750.	.06	900.	.02	300.	.11	1,650.	.05	750.	.10	1,500.	.04	600.	.02	300.	.20	3,000.	.06	900.	.05	750.
22	Miscellaneous Lumber	1	M.B.M.	100.	100.	300.	300.	60.	60.	100.	100.	100.	100.	100.	100.	100.	100.	60.	60.	150.	150.	150.	150.	150.	150.
23	Stream Control, Middle Branch	Lump	Sum	1,000.	1,000.	500.	500.	1,500.	1,500.	3,000.	3,000.	200.	200.	400.	400.	1,500.	1,500.	5,000.	5,000.	20,000.	20,000.	1,500.	1,500.	12,000.	12,000.
24	Stream Control, East Branch	Lump	Sum	1,500.	1,500.	5,000.	5,000.	2,000.	2,000.	3,000.	3,000.	500.	500.	700.	700.	3,000.	3,000.	7,620.	7,620.	10,000.	10,000.	2,000.	2,000.	10,000.	10,000.
25	Cleaning Up	Lump	Sum	500.	500.	500.	500.	500.	500.	3,000.	3,000.	200.	200.	300.	300.	600.	600.	750.	750.	3,500.	3,500.	1,000.	1,000.	1,000.	1,000.
Totals				\$ 171,650.		\$ 188,895.		\$ 196,610.		\$ 201,050.		\$ 204,025.		\$ 227,000.		\$ 233,750.		\$ 240,805.50		\$ 258,525.		\$ 286,500.		\$ 294,250.	

COMMONWEALTH OF MASSACHUSETTS
METR. DIST. WATER SUPPLY COMM.

CONTRACT 66

FOR

CONSTRUCTING REGULATING DAMS ON THE
MIDDLE BRANCH OF THE SWIFT RIVER IN
THE TOWN OF NEW SALEM AND ON THE
EAST BRANCH OF THE SWIFT RIVER IN
THE TOWN OF HARDWICK AND IN THE
FORMER TOWN OF DANA (NOW PETERSHAM)
MASSACHUSETTS

* Contract Awarded Oct. 20, 1938.
Contract Executed Oct. 25, 1938.

I certify the foregoing to be a true and accurate summary of all bids on the
above Contract No. 66 received this day by the METR. DIST. WATER SUPPLY COMM.

R. Nelson Molt
R. NELSON MOLT
Secretary

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION

CONTRACT 73

FOR CONSTRUCTING INVERTED PIPE SIPHONS ON THE
WESTON AQUEDUCT AT SUDBURY RIVER AND HAPPY HOLLOW
IN THE TOWNS OF FRAMINGHAM AND WAYLAND, MASSACHUSETTS

P.W.A. DOCKET NO. MASS. 1520-F
MASS. STATE PROJECT NO. D-202

CANVASS OF BIDS FOR CONTRACT 73

OPENED NOVEMBER 2, 1938.

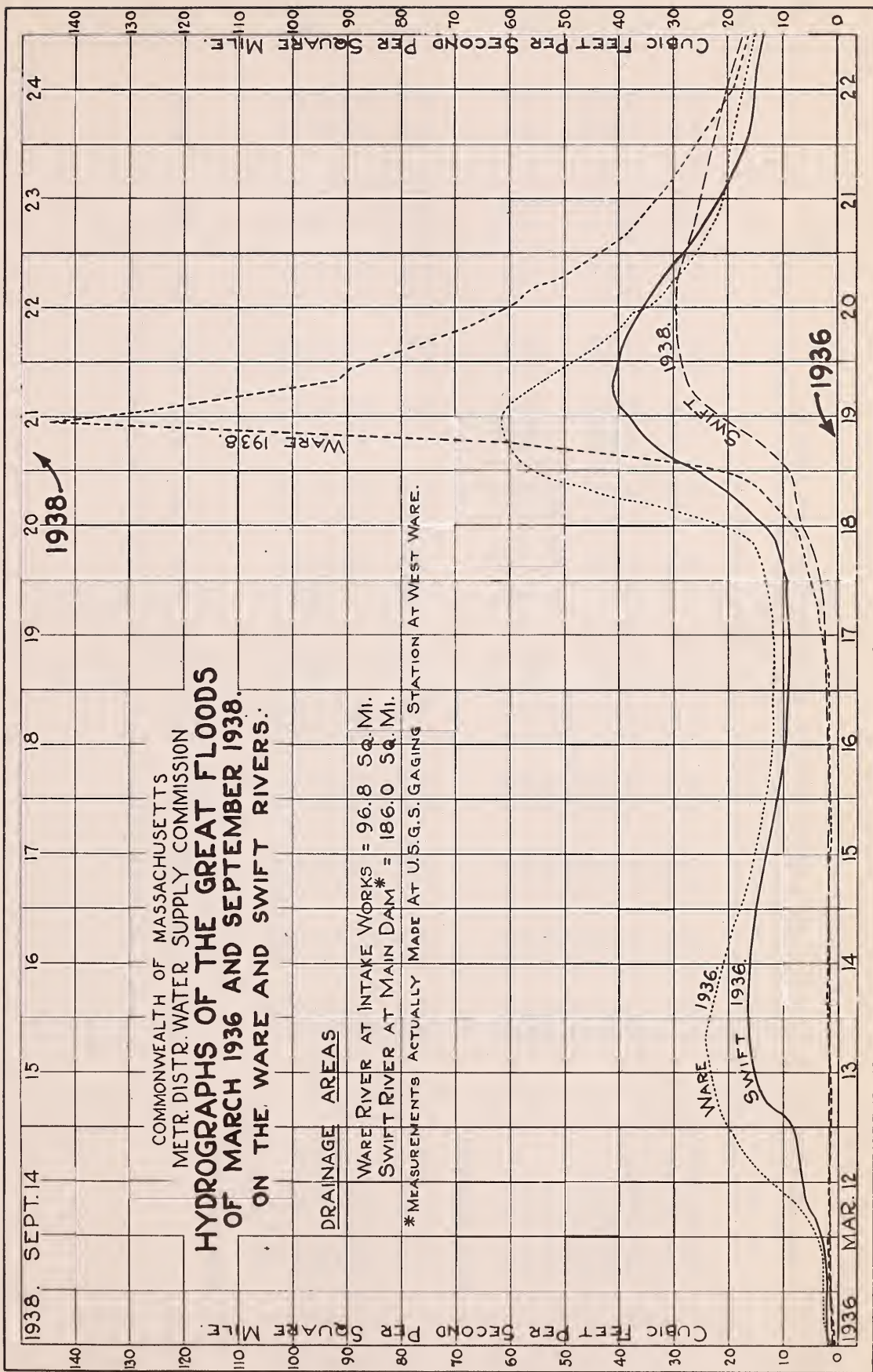
					★ ①		②		③		④		⑤		⑥		⑦		⑧	
					LEO BUTLER COMPANY, Katonah, New York TYPE A.		COLEMAN BROS. CORP., 245 State Street, Boston, Mass. TYPE A.		COLEMAN BROS. CORP., 245 State Street, Boston, Mass. TYPE B.		TULLER CONSTRUCTION CO., 95 Monmouth St., Red Bank, N. J. TYPE B.		JOHN MACDONALD CONST. CO. 215 California Street, Newton, Mass. TYPE B.		V. BARLETTA COMPANY, 10 Whipple Ave., Roslindale, Mass. TYPE B.		V. BARLETTA COMPANY, 10 Whipple Ave., Roslindale, Mass. TYPE A.		SPENCER WHITE & PRENTISS, INC. 10 East Fortieth St., New York, N. Y. TYPE A.	
ITEM	DESCRIPTION	UNIT	QUANTITY		PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT	PRICE	AMOUNT
			TYPE A	TYPE B																
1	Clearing	Acre	2	2	\$175.-	\$ 350.	\$150.-	\$ 300.	\$150.-	\$ 300.	\$300.-	\$ 600.	\$2,000.-	\$ 4,000.	\$1,000.-	\$ 2,000.	\$1,000.-	\$ 2,000.	\$175.-	\$ 350.
2	Earth Excavation	Cubic Yard	40,000	36,600	35	14,000.	1.-	40,000.	1.-	36,600.	30	10,980.	2.-	73,200.	2.-	73,200.	2.-	80,000	35	14,000.
3	Rock Excavation	Cubic Yard	50	50	3.50	175.	5.-	250.	5.-	250.	10.-	500.	14.-	700.	2.-	100.	2.-	100.	18.-	900.
4	Refill and Embankment (except Item 5)	Cubic Yard	27,000	25,500	20	5,400.	30	8,100.	30	7,650.	25	6,375.	50	12,750.	50	12,750.	50	13,500.	50	13,500.
5	Compacted Refill and Embankment	Cubic Yard	6,500	6,500	.90	5,850.	.50	3,250.	.50	3,250.	1.25	8,125.	1.-	6,500.	1.-	6,500.	1.-	6,500.	1.25	8,125.
6	Soil Dressing and Grassing	Cubic Yard	4,000	4,000	1.00	4,000.	1.50	6,000.	1.50	6,000.	1.-	4,000.	2.-	8,000.	1.-	4,000.	1.-	4,000.	1.70	6,800.
7	Crushed Stone and Screened Gravel	Cubic Yard	200	270	2.25	450.	3.50	700.	3.50	945.	3.-	810.	4.-	1,080.	4.-	1,080.	4.-	800.	5.-	1,000.
8	Paving	Cubic Yard	100	100	4.50	450.	4.-	400.	4.-	400.	7.-	700.	4.-	400.	6.-	600.	6.-	600.	4.-	400.
9	Pipe Siphon	Linear Foot	4,785	4,785	44.50	212,932.50	45.-	215,325.	46.-	220,110.	55.60	266,046.	37.-	177,045.	40.-	191,400.	45.-	215,325.	72.50	346,912.50
10	Concrete Envelope	Cubic Yard	1,000	1,600	7.00	7,000.	10.-	10,000.	10.-	16,000.	8.-	12,800.	10.-	16,000.	10.-	16,000.	10.-	10,000.	15.-	15,000.
11	Concrete (except Items 9 and 10)	Cubic Yard	50	50	14.00	700.	15.-	750.	15.-	750.	15.-	750.	14.-	700.	12.-	600.	12.-	600.	32.-	1,600.
12	Reinforcing Steel	Pound	7,000	7,000	.045	315.	.05	350.	.05	200.	.04	160.	.06	240.	.06	240.	.06	420.	.08	560.
13	Portland Cement	Barrel	1,700	2,700	2.70	4,590.	3.-	5,100.	3.-	8,100.	2.50	6,750.	3.-	8,100.	2.75	7,425.	2.75	4,675.	4.20	7,140.
14	Miscellaneous Steel and Iron	Pound	25,000	25,000	.09	2,250.	.10	2,500.	.10	2,500.	.08	2,000.	.08	2,000.	.10	2,500.	.10	2,500.	.14	3,500.
15	Galvanizing	Pound	6,000	6,000	.04	240.	.05	300.	.05	300.	.01	60.	.10	600.	.10	600.	.10	600.	.07	420.
16	Caring for and Setting Metal Work furnished	Pound	6,000	6,000	.04	240.	.05	300.	.05	300.	.08	480.	.04	240.	.10	600.	.10	600.	.05	300.
17	Road Surfacing	Square Yard	2,000	2,000	1.20	2,400.	1.25	2,500.	1.25	2,500.	1.-	2,000.	1.-	2,000.	1.-	2,000.	1.-	2,000.	1.70	3,400.
18	Wooden Sheeting ordered left in place	M feet, B.M.	15	15	45.00	675.	60.-	900.	60.-	900.	50.-	750.	60.-	900.	100.-	1,500.	100.-	1,500.	60.-	900.
19	Tile Pipe 8" or less in diameter	Linear Foot	200	200	.60	120.	1.-	200.	1.-	200.	.50	100.	2.-	400.	2.-	400.	2.-	400.	2.-	400.
20	Tile Pipe 9" to 18" diameter	Linear Foot	50	50	1.40	70.	2.-	100.	2.-	100.	.75	37.50	4.-	200.	3.-	150.	3.-	150.	3.-	150.
21	Sudbury River Crossing	Lump Sum				2,425.		2,000.		2,000.		10,000.		20,000.		10,000.		10,000.		11,000.
22	Cleaning up	Lump Sum				1,200.		500.		500.		2,500.		2,000.		5,000.		5,000.		4,000.
TOTALS					\$ 265,832.50		\$ 299,825.00		\$ 309,855.00		\$ 336,523.50		\$ 337,055.00		\$ 338,645.00		\$ 361,270.00		\$ 440,357.50	
Bid Bond Deposit					Certified Check \$17,500.		\$ 17,500.		\$ 17,500.		\$ 17,500.		\$ 17,500.		Certified Check \$17,500.		Certified Check \$17,500.		\$ 17,500.	

I certify the foregoing to be a true and accurate summary
of all bids on the above Contract No. 73 received this day
by the METR. DISTR. WATER SUPPLY COMM.

--- R. Nelson Molt, Secretary

★ Contract awarded Nov. 9, 1938.
Contract executed Nov. 17, 1938.

TYPE A = REINFORCED STEEL CYLINDER PRECAST PIPE.
TYPE B = STEEL PLATE PIPE MORTAR LINED.



MONTHLY RAINFALL IN INCHES AT STATIONS ON THE WARE AND SWIFT WATERSHED, 1938

Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Total

WARE WATERSHED

Ware River Intake	3.99	2.37	2.31	3.15	3.70	8.99	3.62	3.03	16.13	2.25	3.65	3.01	61.25
Works*	4.36	2.41	2.38	3.23	3.74	8.76	7.96	3.51	12.71	2.16	3.40	3.83	58.45
West Rutland*	3.72	2.15	1.78	3.36	3.55	7.83	10.37	1.69	17.15	2.72	2.83	2.89	60.04
North Rutland	4.47	2.12	2.51	2.87	3.79	8.33	9.45	3.74	15.15	2.68	4.25	3.30	62.66
Williamsville	3.56	1.80	2.45	3.28	4.36	8.67	8.00	2.58	18.28	2.36	3.09	2.91	61.34
Hubbardston													
1938 Mean	4.02	2.17	2.29	3.18	3.83	8.52	8.38	2.92	15.88	2.43	3.44	3.19	60.75
15-Year Mean	3.59	2.83	3.66	3.57	3.30	4.15	4.22	4.06	5.48	3.29	3.53	3.12	44.80

SWIFT WATERSHED

West Ware	4.07	2.19	2.34	2.64	2.83	7.38	8.50	1.88	16.63	2.43	2.85	2.94	56.68
Enfield *	4.35	3.12	2.85	3.30	3.55	9.66	11.74	2.59	15.33	2.75	3.42	3.75	66.41
Greenwich	4.07	2.39	2.83	3.27	3.37	8.46	Discontinued						
Prescott	4.88	2.34	2.55	Discontinued									
Shutesbury	5.15	2.21	2.07	3.20	4.18	8.69	8.12	3.29	14.93	2.82	3.36	4.22	62.24
Wendell	5.51	2.15	2.17	3.16	4.76	8.51	7.18	3.91	14.25	2.83	3.56	4.02	62.01
Petersham**	4.57	2.39	2.12	3.05	4.05	7.43	8.19	3.29	15.78	2.17	3.97	3.73	60.74
1938 Mean***	4.73	2.41	2.31	3.07	3.87	8.34	8.75	2.99	15.39	2.60	3.43	3.73	61.62
19-Year Mean***	3.64	2.92	3.57	4.09	3.53	4.92	4.24	4.19	5.19	3.19	4.11	3.31	46.90

* Station maintained by the Metropolitan District Water Supply Commission.

** Station maintained by the Metropolitan District Commission.

*** Data for all other stations obtained through courtesy of the State Department of Public Health.

*** Rainfall at the Greenwich and Prescott stations not included in these figures.

COMMONWEALTH OF MASSACHUSETTS
METR. DISTR. WATER SUPPLY COMMISSION
**SUBSTITUTE HIGHWAYS IN
QUABBIN RESERVOIR AREA**

DESCRIPTION	CONTRACT NO. DATE	PAID BY DEPT. OF PUBLIC WORKS	PAID BY METR. DISTR. WATER SUPPLY COMM.	TOTAL FINAL ESTIMATE	WORK COMP.	TURNED OVER TO DEPT. OF PUBLIC WORKS
5.22 Miles, Ware-Belchertown Highway Route 9, in Ware and Belchertown.	21 July 20, '31.	\$ 95,726.94	\$ 129,980.25	\$ 225,707.19	Aug. 22, '32.	Sept. 7, '32.
9.13 Miles, Daniel Shays Highway Route 202, in Belchertown and Pelham.	41 July 20, '33.	118,486.97	130,091.17	248,578.14	Nov. 20, '34.	Dec. 4, '34.
7.61 Miles, Daniel Shays Highway Route 202, in Shutesbury and New Salem.	43 Aug. 25, '33.	120,567.89	267,037.58	387,605.47	Dec. 17, '34.	Jan. 8, '35.
4.10 Miles, Daniel Shays Highway Route 202, in New Salem and Orange.	44 Nov. 15, '33.	63,222.73	136,717.39	199,940.12	Nov. 20, '34.	Dec. 4, '34.
4.34 Miles, Petersham-New Salem Highway in Petersham.	55 June 23, '36.	110,991.47	128,165.18	239,156.65	July 19, '37.	Oct. 21, '37.
3.64 Miles, Petersham-New Salem Highway in New Salem.	57 Sept. 1, '36.	73,051.06	95,771.90	168,822.96	Sept. 29, '37.	Oct. 21, '37.
1.83 Miles of Hardwick-Petersham Highway in Petersham.	54 May 22, '36.	NONE	63,840.60	63,840.60	Nov. 17, '36.	DEEDED TO TOWN OF PETERSHAM May 27, '37.
35.87 MILES — TOTALS —		\$ 582,047.06	\$ 951,604.07	\$ 1,533,651.13		

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